ELECTRICAL REVIEW

[ILLUSTRATED.]

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The Davey Safety Engine.

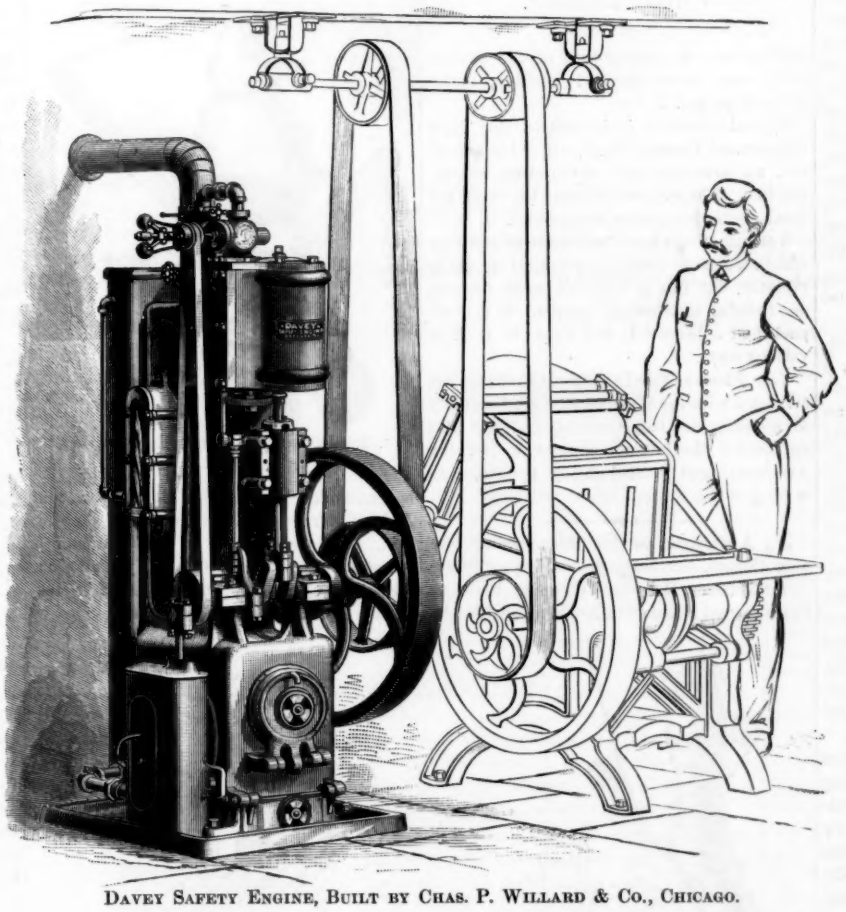
The Davey Safety Engine, or Vacuum Motor, of which we present an engraving in this edition of the REVIEW, is an invention of Henry Davey, Esq., a mechanical engineer of prominence in England, where he is well known as a manufacturer of hydraulic machinery, and as the inventor of the Differential Pumping Engine, now extensively used in the public water-works and mines of Great Britain, as well as to some extent in America. This engine is built under license by Chas. P. Willard & Co., 284 Michigan street, Chicago, who now present it for the first time in America. Where a small, cheap and positively safe and steady power is required this engine is destined to become very popular. In principle it is unlike any of the steam, gas, hot-air, or petroleum engines heretofore offered to the public. It differs from an ordinary steam engine in the fact that while a small quantity of steam is made in the generator, which is a part of the machine, steam is not the motive power employed to do the work, and only as much is made in the smaller sizes as would be generated in a large tea kettle, and this at only atmospheric pressure; that is, at the same pressure at which it would flow from the spout of a tea-kettle, or escape from under a pot lid; the only function of the steam being to create, by condensation, a vacuum, which is the motive power. The engine is double-acting, a vacuum being created alternately at each end of the cylinder. There is absolutely no pressure in the generator, and consequently can be no danger of explosion, under any circumstances whatever. They range in weight from 700 to 1,800 pounds, and are extremely substantial and durable.

Aside from the question of danger attending the use of the ordinary steam boiler under careless management, there is probably no one thing which will commend this motor more strongly to the public than the fact that it requires no attention beyond simply keeping up the fire, and giving the wheel two or three turns when ready to begin operations. There is no safety valve, no exhaust, no steam gauge, no gauge cocks, no boiler feed pump or injector, or any of these adjuncts of an ordinary steam-engine.

Anything may be used for fuel which will go into the fire-box; either soft or hard coal, wood, coke, or cobs. Petroleum, naphtha, or common gas can be used by a proper arrangement of pipes in the fire-box. The quantity of fuel needed is surprisingly small, as the amount of water to be evaporated is quite limited, and if hard or soft coal or coke is used, the cost will not exceed, it is claimed, one cent per horse-power per hour.

For electric lighting purposes, or where absolutely steady power is required, the Davey Safety Engine is particularly valuable. It receives two impulses each revolution, the same as a high-pressure engine, and the force is exerted throughout the entire stroke, the last inch of piston travel being as efficient as the first inch.

Although new in this country, these engines have already come considerably into use in Great Britain and France, published tests of their performance showing good economical results. They are suitable for all kinds of light work, including furnishing power for small electric light plants, as in country residences, and seem to be particularly suited for household purposes, where their absolute safety will commend them.



DAVEY SAFETY ENGINE, BUILT BY CHAS. P. WILLARD & CO., CHICAGO.

Electrolytic Extraction of Copper.

It is generally understood that several of our largest English copper works have of late been paying special attention to the electrolytic separation of metallic copper, especially in the case of argentiferous copper ores and regulus. But as considerable care is taken to prevent publicity, but little is known as to actual details and results outside the circles immediately concerned. Some of the German metallurgical journals are just now taking considerable notice of a process which is being adopted at the large works of the Stolberg Company, in Prussia. The process is that brought out by Marchese, an Italian engineer and chemist, and said to be working successfully on copper ores at Casarza, near Sestri Levante, not far from Genoa. The method so far mostly, if not almost exclusively, in use, has been to produce, first of all, an impure metallic copper ("black copper" of the Germans), and to refine this by electrolysis, separating out any silver and gold it may contain at the same time with the impurities. But Marchese has adopted another arrangement. Having to work poor copper ores at Casarza, he first smelts a portion of the ore to copper regulus containing some 30 per cent. copper and 40 per cent. iron. This regulus is cast into thin slabs to form the anodes in the depositing tanks, a strip of copper being cast into each anode to serve for the connection to the conductors from the dynamo machine.

Another portion of the ore is calcined, then lixiviated with water containing a little sulphuric acid, to dissolve the copper. The solution, containing sulphate of copper and sulphate of iron, is fed into the depositing tanks in which the regulus anodes are suspended, the cathodes consisting of a corresponding number of copper sheets. The copper in the solution is deposited on the cathodes, the anodes being at the same time consumed with solution of the copper contained in them. It is stated that the salts of iron formed, and the sulphuric acid, prevent the deposit of any of the iron from the sulphate solution, and also prevent any disengagement of hydrogen, so that the copper is deposited in a firm and perfectly pure state. The liquor is kept in constant circulation between the ore in the lixiviation tanks and the depositing tanks. It is said that "the greater portion of the electromotive power requisite for the decomposition of the sulphate of copper, is supplied by the oxidation of the iron contained in the anodes," so that the power required to be supplied for the work of this process is very small. When, in course of time, the solution becomes too much saturated with sulphate of iron, it is withdrawn from circulation, and all the copper removed from it by sulphuretted hydrogen (generated by the action of the solution itself on some of the copper regulus). The remaining solution of iron is then crystallized for copperas if it pays, or run to waste if it does not pay.

The above is Marchese's process in outline. It attracted the attention of the Stolberg Company as a possibly good one for them to adopt for working a quantity of copper regulus which they produce every year in the course of smelting silver-lead ores containing copper. Experiments were tried during some months under the supervision of Marchese himself, and it is stated that they were so satisfactory that a permanent plant is now in course of erection, and will soon be ready for use. The experimental work was done on regulus containing some 15 to 16 per cent. of copper, 14 per cent. of lead, and 16 ounces silver per ton. A portion of this was cast into anode plates, as above described. There were six depositing tanks, each with seven anodes and eight copper sheet cathodes. The six tanks stood side by side, forming one series for the current. The dynamo machine used was by Siemens and Halske, Class C_6. The conductors were copper rods of 1 cm. thickness.

Another portion of the regulus was calcined and lixiviated as above described, and the resulting liquor filled the depositing tanks to within 1 cm. of the top edge of the anodes. It then overflowed from each tank into a launder, which conducted it back to the lixiviation tank. After again saturating itself with copper, it passed to a settling tank, from which it was pumped back to the depositing tanks.

The liquor varied between 3 and 4 per cent. of copper. The iron in solution of course constantly increased, but during two months of work it did not reach saturation and require removal. The dynamo machine ran for two months with scarcely a minute's interruption, the average speed being 1,118 revolutions per minute. The average current equaled 92 amperes. The copper deposited amounted to 2.261 kilos. per tank per twenty-four hours. The plant now being erected at Stolberg is intended to produce, from copper regulus, 500 to 600 kilos. of copper every twenty-four hours. There are to be fifty-eight depositing tanks, in each of which will be twenty anodes with a surface of 25 square meters, and an equal surface of cathodes. The twenty anodes, each weighing 125 kilogrammes, give 2½ tons regulus per tank, or 145 tons for all the fifty-eight tanks. In order to attain the usual thickness, the cathodes will have to remain three months in the tanks. Calculating the average amount of copper locked up in the anodes and cathodes on the above basis, it is shown that the amount of capital "immobilized" in this manner will be 40,000 francs for an annual production of 210 tons of copper. Compared with the cost of ordinary smelting processes

for extracting copper from regulus, the interest on this sum will form no bar to the economical success of the process, even apart from considerations as to the better price obtained for pure electrolytic copper. Full details of the process and of the experiments at Stolberg may be obtained from a treatise written by Marchese, and published in Genoa, "Traitement électrolytique des mattes cuivreuses au Stolberg, par le procédé E. Marchese."—*London Engineering.*

Electric Gas Lighting.

Among the practical and convenient uses to which electrical devices have been put, the various methods of gas lighting is not the least. The Electric Gas Lighting Company, of 45 Milk street, Boston, is a corporation organized for the manufacture and general introduction of electric gas-lighting apparatus and we illustrate a number of their excellent devices in this edition.

In the Automatic System, a press-button, conveniently located, switches a current of electricity from an open-circuit battery over a wire to a burner. There it energizes a magnet which attracts an armature. The armature, as it moves, turns the gas-cock to let on the gas, and *also* withdraws the movable from the fixed electrode at the burner tip, thus breaking the electric circuit. The spark made by this rupture ignites the escaping gas. If a number of automatic burners are to be lighted, a switching mechanism, or commutator, transfers the current to each in turn with great rapidity. To extinguish the gas, the armature is again moved, by touching a second press-button, to close the gas-cock. Automatics for domestic use have also been widely introduced for single lighting in private residences, churches, stores and offices, and have proven so attractive and useful that they have come to be considered almost indispensable. House Automatics, made under the 1872 patent, and embodying the Original Ratchet movement, have been in daily use in Boston and vicinity for seven or eight years, giving satisfaction. The Gas-Lighting Company claims that all automatic burners using a single current of electricity to turn on, light and turn off the gas, are infringements of this Company's re-issue patent No. 9743, of June 7, 1881, improved November 28, 1876 and July 16, 1878.

The New Ratchet Automatic Fig. 1, contains an electro-magnet and an armature, a circuit-breaker, ratchet-wheel, pawl and commutator. By the touch of a press-button, an electric current from the battery is sent through the helix of the magnet, which vibrates the armature carrying the circuit-breaker. The armature, having a pawl attached to it, also rotates the ratchet-wheel connected to the spindle of the gas cock to open the valve. The issuing gas is lighted by the sparks made at the burner tip where the circuit is broken. To extinguish the gas, the pressure of a second button sends a current through the helix, which again actuates the armature and forces the pawl to further rotate the ratchet-wheel, and so shut off the gas.

This Company also states that it owns Letters Patent covering Electric gas-lighting appliances operated by hand, where the lighting is accomplished by the vibration, at or near the burner tip, of a movable electrode; and also, where the operation by hand devices, of a movable electrode either permanently or detachably fixed to the stop-cock of the burner, serves to turn on and shut off the gas.

The Boston Ratchet Burner has been extensively introduced and used, and has given good satisfaction.

An eight toothed ratchet-wheel governs a stop-cock with four gas-ways, and is so arranged with pawl and spring that a single pull at the pending chain either lights or extinguishes the gas. This operation brings the movable arm with its elastic contact point past the fixed electrode at the burner tip, there producing the electric sparks which ignite the issuing gas.

The Tip-Top Ratchet Burner contains a check, or gas regulator, without a bulb. It differs materially from the Boston Ratchet Burner No. 3, in the shape of its fixed electrode and manner of making contact. There is an upright elastic coil-spring contact point, so attached to the movable arm that it cannot pass through the flame.

The New Thumb-Cock Burner has an attachment fixed upon the small end of an ordinary gas-cock, which is located in the base of the burner, consisting of a vibrating arm with an elongated hole, tripping pin and cam. By the opening movement of the gas-cock the vibrating arm, with its upright elastic contact point, is forced against and past the fixed electrode at the burner tip, tripped and then returned by means of the retractile spring to its normal position, leaving the gas turned on

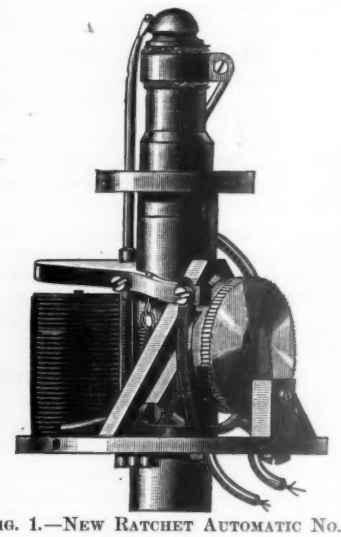


FIG. 1.—NEW RATCHET AUTOMATIC NO. 4, WITHOUT ITS SHELL.

and lighted,—a quarter turn of the thumb-cock, back to its original position, extinguishes the gas.

Special attention is invited to this New Lighter and Burner, Fig. 5, which has a magnet, an armature and a vibrating circuit-breaker. The magnet is inside the shell, the fixed electrode forming the ground.

Various efforts have been made to produce, within suitable limits, a practical working vibrator, but this is believed to be the first one to bring satisfactory results. It is compact and substantial, and may be used in various ways.

The Electric Gas-Lighting Company has arranged with the Western Electric Company to manufacture these goods, and has also authorized the latter company to sell the Automatic and hand-lighting apparatus in several of the States.

*** A stranger, having the appearance of a gentleman, hurriedly entered United States Commissioner Davison's office at Saratoga Springs, and asked permission to use his telephone. It was granted, and the stranger called up a business house in Troy and had the desired conversation. "Thank you," said he, as he was hurrying away. "Hold on," said the thoughtful Charles, "that transaction cost me 25 cents!" "All right," said the beat, "I'll see you paid," and he dodged around the corner and was seen no more. Charles proposes to "choke off" the next patron of that kind that comes in.

*** The Tropical American Telephone Company has declared a dividend of 10 cents per share.

*** The Bell Telephone Company have

METHOD OF OPERATING NO. 3.

again been unsuccessful in litigation in Canada. It will be remembered that an application was made before the Minister of Agriculture at Ottawa on behalf of the Toronto Telephone Manufacturing Company to cancel the patent of the Bell Company, on the ground that they had not complied with the provisions of the patent act as to manufacture and importation. Pending the hearing of this motion, the Bell Company applied to Mr. Justice Osler for a writ of prohibition to restrain the Minister from hearing it. The learned judge refused the motion, and the Bell Company gave notice of appeal to the Court of Appeal, but in the meantime the Minister gave his decision voiding the Bell patent. The appeal is still waiting to be heard. Rather strange, it is true, to argue for a prohibition to restrain the Minister from doing what he has already done, but it

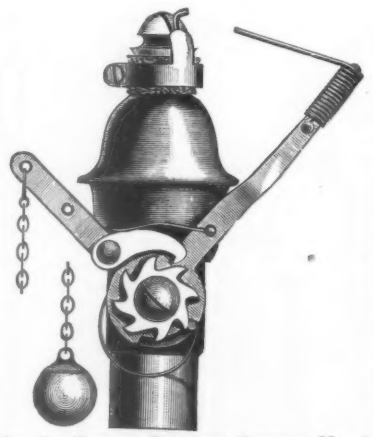


FIG. 2.—BOSTON RATCHET BURNER NO. 3.

is contended that, should it appear that Judge Osler was wrong in refusing prohibition, then the decision of the Minister is valueless, he having had no jurisdiction. The Bell Company, wishing to have two strings to its bow, caused a motion to be made to the Common Pleas Divisional Court for a writ of certiorari to bring up all the Ottawa proceedings for review in a superior court. Judgment was delivered on Saturday dismissing that motion, and leaving the Bell Company to prosecute its appeal, or to appeal from its decision. It is interesting to note that Judge Osler held the Minister was acting in a judicial capacity, whereas the court now holds that his functions are not judicial, but merely ministerial.

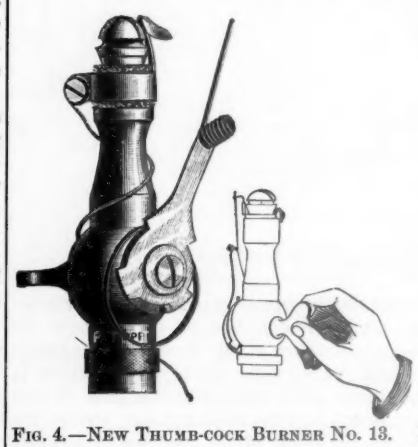


FIG. 4.—NEW THUMB-COCK BURNER NO. 13.

FIG. 3.—TIP-TOP RATCHET BURNER NO. 7.

.... British Lloyds are about to establish at Aroga Point, on the island of Teneriffe, a signal station, in telegraphic communication with London by means of the cable recently laid connecting Teneriffe and Cadiz. The date of the opening will be shortly announced.

.... The semi-annual report of the Direct Cable Company, made public July 15, shows that the receipts for the first six months of the present year have been £32,467 less than they were during the corresponding period of 1884. The falling off is owing to a reduction in traffic.

.... During an unusually severe storm which passed up the Alleghany river, lightning struck the telegraph wires near Harmersville station, on the West Pennsylvania Railroad, entered the station tearing it from top to bottom and throwing the furniture about in the greatest confusion. Miss Haglett, the telegraph operator, was thrown across the room and rendered insensible. James McFetters, aged 16 years, a messenger boy, was instantly killed.

.... Through the kindness of S. B. Gifford, Superintendent of the Western Union Telegraph Company, Laurence J. McParlin, superintendent of the fire alarm of Lockport, N. Y., has been allowed to run a loop from the Western Union Telegraph office to Charles C. Brown's jewelry store, and attach the same to a wire running directly to the National Observatory at Washington, D. C. By this means the last blow struck on the city triangles and gongs at noon each day, is sounded simultaneously with the last stick (12 M.) of the pendulum of the clock at the Observatory.

.... Some remarkable work was done in England on a quadruplex circuit during the Ascot races between the Central Telegraph Station and Ascot. On Monday, 2,325; Wednesday, 3,007; Thursday, 2,234; and Friday, 2,132 messages were sent, making a total of 9,698. The greater part of the work of each day was confined to three hours. On one day 1,691 messages were dealt with between noon and 3 P. M. In one hour 606 messages were signaled. The messages were of average length. Multiple address and press messages were counted as one message.

.... The Apaches have smoke signals by day and fire beacons at night, and systems of telegraphy understood only by themselves. The displacement and overturning of a few stones on a trail, or a bent or broken twig, is a note of warning like the bugle call to disciplined troops. They are cunning as the red fox, insatiate as tigers, and so ingenious in preparing for surprises that they will envelop themselves in a gray blanket and sprinkle it carefully with earth, so as to resemble a granite boulder, to be passed within a few feet without suspicion. Again they will cover themselves with fresh grass and, lying motionless, appear as a natural portion of the field.

.... When the construction of the great trunk subterranean telegraph lines in France and Germany was entered upon, it was thought that, owing to their depth underground, and their sheathing of metal in contact with the earth, they would be exempt from the influences of atmospheric disturbances. M. Blavier, the well known electrician, has nevertheless pointed out recently to the French Academy of Sciences, that in times of storm, currents are produced in these lines, which discharge themselves through the lightning protectors, melting their fine wires. They are, however, less violent than the currents in aerial wires, and do not appear to interfere with the traffic. They are evidently due to storms in the country, at a distance more or less great from cities, where the lines are protected by systems of gas and water pipes. During a storm on March 9, at the middle of the line between Belfort and Besancon, sparks were seen at the terminal stations, whilst in the two cities hardly any atmospheric perturbation was noticeable. M. Blavier explains the phenomenon, which is familiar to those who have tested submarine cables in tropical seas, as due to electro-dynamic or electro-static induction caused by the electricity of the storm.

Secondary Batteries—(*Concluded*).

By Frank Geere Howard, Stud. Inst. C.E.

All secondary batteries, when first set up, should be tested for insulation. This may easily be done by connecting one pole of the battery (after it has been charged) to one terminal of an ordinary galvanometer, and the other terminal of the galvanometer to earth. The best way to obtain a good earth is to connect the wire to a water or gas pipe; or if neither of these should be available, to drive a piece of iron into the ground and make a connection in that way. If the needle is deflected it indicates leakage, which should at once be remedied. The leakage will in all probability be found to arise from an escape of the solution from one of the cells, the place where they are standing being damp, or one of the leads "making earth." The poles of the cells should be connected together by stout bars of metal. It is inadvisable to use copper on the positive pole of a cell on account of the rapidity with which it corrodes. Plain lead connections or a mixture of lead and antimony are the most trustworthy. The positive pole of one cell is joined to the negative of the next, and so on all through the series. Then the positive pole of the dynamo is connected to the last positive of the battery, and the negative to the negative. The contacts must be properly made between each cell, as a bad contact will produce a great deal of heat in the cells, thereby introducing resistance into the circuit and reducing materially the rate of charge or discharge. Care should be taken not to charge the battery at too rapid a rate, and if at any time during the charging the cells become warm, the charging should be stopped, and the battery allowed to cool down. The heating of the plates causes them to buckle, often resulting in the short-circuiting of the cell, and thus putting it out of use until the defect has been remedied.

During the charging, and also whilst they are at rest, it is advisable to test the cells from time to time. This may be readily done by taking a short length of stout wire, holding one end upon one pole of the cell to be tested, and striking the opposite pole with the other end of the wire. If the cell is in good condition it should give a bright crisp spark. If it gives no spark at all it shows that there is a short circuit in the cell, arising in all likelihood from two of the plates touching each other, or from a small piece of some conducting substance having fallen down between the plates. This should be at once remedied, otherwise the cell should be cut out from the circuit and taken to pieces It is very important when working batteries to keep all the cells in as even a condition as possible. For if a cell be empty, or is discharged before the others, it will then become recharged in the reverse direction, and thus set up an opposing electromotive force to the rest of the battery, besides there is the risk of spoiling that particular cell. Keeping all the cells in the same condition is best effected by observing them when charging, and cutting out of the circuit all those cells that give off gas freely, and continuing to charge the others until they are all fully charged. If this is done about once in two months, the working efficiency of the battery will be maintained at a very high point. Of course, this entails extra labor, but the author contends that secondary batteries do, and always will, require skilled supervision. Care must be taken not to cut out too many cells whilst charging the battery without introducing a corresponding resistance, or the dynamo will be burnt.

The ordinary strength of the electrolyte is 1 part of sulphuric acid to 9 parts of water, or of a specific gravity of 1.2; that of sulphuric acid being 1.84. The water should be as pure as possible. When working a battery it is necessary to keep all the plates immersed in the electrolyte. If it becomes necessary to add to the electrolyte to keep the cell full, water only should be used, otherwise the solution will become too strong. When batteries are left out of use for any length of time, it is advisable either to remove the solution and wash the plates and boxes with water, or else to leave them fully charged. This latter method is perhaps best adopted only when the battery is not to be out of use for very long. It is found that when batteries are left idle and full of the solution, sulphate of lead will form all over the plates, and have a serious effect upon their future working.

By discharging a cell too rapidly as much harm can be done to it as by charging it too rapidly.

The best dynamos for charging accumulators are shunt dynamos. Both the series and compound machines are liable to have their poles reversed by the batteries discharging through them, which is likely to arise from the speed of the dynamo decreasing, and thereby having its electromotive force overpowered by that of the battery. This difficulty might be overcome by specially designed automatic switches. The most economical way is to charge each battery in two series in parallel, though, of course, whilst charging them in this manner, no lights can be run at the same time. The circuit should be so arranged that the dynamo is charging the battery in two series in parallel, or in one series with the lamps in parallel, or dynamo, lamps, and battery all in parallel.

In order to charge an accumulator, it is necessary to employ a dynamo giving an electromotive force greater than that of the cells, and greater in proportion to the rate of charge required; but as all excess of electromotive force is lost energy, a slow charge is the most economical where time is of little moment.

The uses to which accumulators may be put are almost endless. They are serviceable for every application of the electric current. Lighting being at present the most in need of them, by employing an accumulator in any installation, the failure of the light should be rendered almost impossible.

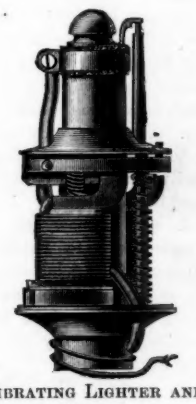
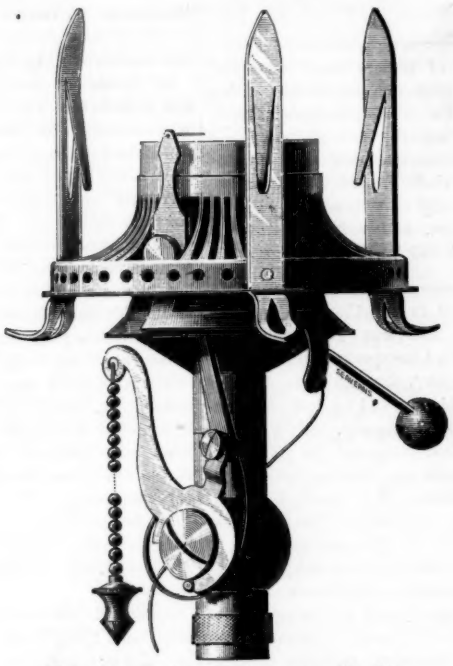


Fig. 5.—Vibrating Lighter and Burner No. 15.

The employment of secondary batteries for driving trains, tramcars, boats, etc., has been a good deal discussed, but up to the present time, although many costly experiments have been undertaken, no practical work has been done.

The main reason why electricity has not yet been employed for motive power for boats and tramcars is, the author thinks, undoubtedly to be traced to the still imperfect and unsatisfactory state of secondary batteries. When once they have been so far improved as to be looked upon as trustworthy, a great and lasting impetus will certainly be given to the utilization of electricity, for motive power as well as for lighting purposes.



The Simple Argand Lighter, No. 16.

* * Mr. Mackay, one of the proprietors of the new Atlantic cables, is stated to be the richest man in the world. His wealth is estimated at $275,000,000; Rothschild possesses $200,000,000; Mr. Vanderbilt, $175,000,000; the Duke of Westminster, $80,000,000; and Jay Gould, of the Western Union Telegraph Company, $50,000,000. Five men possess the almost fabulous sum of one hundred and fifty-six millions sterling.

Method of Operating No. 15.

* * The July number of the *Franklin Institute Journal* contains the illustrated general report of Colonel Charles H. Banes, chairman of the Committee on Exhibitions. It brings together in clear view the results of the Exhibition Institute. The total number of admissions was 282,779, and the cash sales of tickets amounted to $98,639.70. The entire expense of erection of buildings, the cost of shafting, steam piping and general preparations, as well as the running expenses, were promptly met and a balance of a few thousand dollars left in the treasury. This was accomplished without Government aid or the use of public moneys. Lectures were given on electrical subjects before the general public and to about fifteen thousand school children, eighty thousand primers of electricity were sold, and a reference library of nearly three thousand books, pamphlets, etc., on electricity, collected and presented to the Franklin Institute for a memorial library. In addition to the slight money profit resulting from the Exhibition, the great building remains also clear of expense for the Novelties Exhibition for the autumn of this year.

An Inventor's Pluck.

A kind of courage is exemplified in a story told by a young New York inventor, who, about twenty years ago, spent every dollar he was worth in an experiment which, if successful, would introduce his invention to public notice and insure his fortune, and —what he valued more—his usefulness.

It failed. The next morning the daily papers heaped unsparing ridicule on him. Hope for the future seemed vain. He looked around the shabby room, where his wife, a delicate little woman, was preparing breakfast. He was without a penny. He seemed like a fool in his own eyes; all these years of hard work were wasted. If he were out of the way she could return to her friends. He went into his chamber, sat down and buried his face in his hands, with a desperate resolve to end it all. Then, with a fiery heat flashing through his body, he stood erect.

"It shall succeed," he said, shutting his teeth. His wife was crying over the papers when he went back. "They are very cruel," she said.

"They don't understand. I'll make them understand," he said, cheerfully.

"It was a fight for six years," he said afterward. "Poverty and sickness and contempt followed me. I had nothing left but the dogged determination that it should succeed." It did succeed. The invention was a great and useful one. The inventor is now a prosperous and happy man. "Be sure you're right," he says to younger men, "then never give up."

* * Jules Garnier has designed an elevated railway for the city of Paris, which is to be completed in time for the exposition of 1889. *Science* says this will be about eighteen miles long, and will cost $10,000,000. The structure will be composed of two tracks, one above the other, on an iron frame. The trains will be composed of three American cars, each fourteen meters in length, and two platform or open cars. They will run every five minutes for seventeen hours each day, and will connect with the railway stations.

* * The largest organ in the world, with the exception of the one at Riga, Russia, is in the Cathedral of the Incarnation at Garden City, Long Island. The instrument, which was built by Mr. Hilborne L. Roosevelt, is distributed in four distinct and widely-separated localities of the cathedral, although the whole is under the control of one performer, through the agency of electric action. Steam power is used in inflating the bellows. One engine is placed beneath the chancel division to supply it with compressed air, and another beneath the tower to operate the bellows of the chapel division, the tower division and the magneto machine, which generates the electricity. All the wires used in making the electric connections of the instrument stretched out in a continuous circuit would extend over a distance of 21 miles.

* * The electric resistance of "platinoid," the new alloy invented by Mr. F. W. Martins, of Sheffield, England, has been recently measured by Mr. J. T. Bottomley, of the University of Glasgow. Platinoid is practically German silver with from 1 to 2 per cent. of tungsten in it. The tungsten is added in the form of phosphide of tungsten, a considerable percentage of which is in the first place fused with a proportion of the copper. The nickel is then added, then the zinc and the remainder of the copper. The mixture requires to be fused again and again; and during the process the phosphorus and a considerable portion of the tungsten originally added are removed as scoriæ. In the end a beautiful white alloy—namely, platinoid—is obtained. When polished, it is hardly distinguishable from silver. Mr. Bottomley has tested its alleged power of resisting tarnishing influences by exposing ornamental specimens in the ordinary town atmosphere, and finds it to have remarkable properties of resistance in this respect. He also finds that it excels German silver in its fitness for galvanometer and resistance coils—that is to say, in highness of resistance and freedom from variation of resistance under small changes of temperature. The resistance of German silver differs considerably in different specimens.

Electrical Review.

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GEO. WORTHINGTON, - - - Editor.
CHARLES W. PRICE, - Associate "
LOREN N. DOWNS, - - - President.
C. C. HASKINS, } Consulting Electricians.
GEO. A. HAMILTON, }

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, JULY 25, 1885.

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Gentlemen of the Electric Motor: There may be more in the storage battery than is dreamt of in your third-rail philosophy.

Several of the large electrical manufacturing companies report an improvement in business for two weeks past, and are now expecting a gradual change for the better to follow the depression that all have felt for three or four months.

At a meeting of the Board of Directors of the Western Edison Light Company, Chicago, John M. Clark was elected President of the company in the place of General Anson Stager, deceased, and Robert T. Lincoln was elected a director of the company to fill the vacancy in the board caused by General Stager's death.

The Standard Electrical Works, of Cincinnati, paid a dividend of 5 per cent. on the 10th instant on the business of the past six months, which is a splendid showing for these times. This company reports business fair, and a steady demand for the "Post" magneto bell. Mr. Cherry, vice-president of the company, is an active worker in the electrical field, and has just made an extended tour through the East with good results.

The specifications presented by the United States Government to bidders for wire and cable contracts read as if taken from a catalogue of English manufacturers. An American doesn't feel particularly encouraged on reading them.

Mr. O. E. Madden, assistant general manager of the American Bell Telephone Company, has decided to retire from active participation in the affairs of the company, his resignation taking effect August 1st. Mr. C. J. French, who has been connected with the company since January 1st, with headquarters in Chicago, will succeed Mr. Madden.

The question of underground wires and cables will be a prominent one at the meeting of the National Electric Light Association in this city next month, and the delegates should come prepared to shed light on this problem. The Underground Wire Commissioners of this city and Brooklyn will, no doubt, be present, and will probably get some points that will be of particular value to them.

In the United States Circuit Court, of Baltimore, the American Bell Telephone Company and the Chesapeake and Potomac Telephone Company, through Hon. Charles J. M. Gwinn, filed a bill against the Pan-Electric Telephone Company, the Washington Telephone Company, and the Washington Telephone Company of Maryland. Gen. Bradley T. Johnson and J. Frank Morrison, the former the president of the two companies, ask the court for an injunction to restrain the defendants from making, using or selling any speaking telephones embodying the combinations used by the complainants, the owners of the original patent. The bill is a lengthy document, covering 42 pages of type-writing.

Judge Shipman, of the U. S. Court at Hartford, has ordered the Bankers and Merchants' wires, seized by the Western Union under contract with Receiver Harland, to be returned. Under the decision of the court, the Bankers and Merchants' will recover nearly all, if not all, of their seized wires, and will be able to resume business. Points from which they were cut off by the seizure, and with which, under the decision, they will connect, are Boston, Hartford, Meriden, Springfield, Willimantic, Providence, Albany, Utica, Buffalo, Cleveland, Philadelphia, Pittsburgh, Harrisburgh and Baltimore. One of the officials of the Western Union says: "We did not mean to take any more than we were entitled to, but on some of the poles of the American Rapid Company were wires of the Bankers and Merchants', and, of course, in the hurry we could not discriminate. We will restore these, and then we shall get all the wires of the Rapid Company, some of which the Bankers and Merchants' have now."

TELEPHONY IN FRANCE AND THE NEW MINISTER OF POSTS AND TELEGRAPHS.

It was only last week that a French contemporary of ours, *Bulletin International des Telephones*, said that the French had arrived at that point where they got their electrical science, as well as their politics, from America, and it emphasizes their remark this week by finding fault with the new Minister of Posts and Telegraphs, in a style characteristically *à la Americain*. We do not mean by this to find any fault with their strictures on M. Sarrien. No doubt he deserves them, and more too, and, at any rate, if he doesn't deserve the punihsment now, he is pretty sure to *in futuro*, for the office is a difficult one. No, we only want to record our satisfaction at the fact that the French are at last beginning to put away all indiscretion in speaking, and speak out boldly, as they ought to.

The laurels won by M. Cochery seem to disturb the rest of his successor, M. Sarrien, says the *Bulletin International*. Indeed, the new Minister of Posts and Telegraphs seems determined to signal his appearance on the field by measures which are more original than timely, or useful

M. Sarrien seems to think it necessary that the State should be possessed of a monopoly in the ownership of the inventions of M. Van Rysselberghe. And in confining himself to this system, he has voluntarily deprived the State of the advantages of all the other inventions having to do with long-distance telephony, and discouraged the inventors who are working in this field. The State ought not to become an exclusive concessionary, but should purchase only those licenses which lease it liberty of action and do not impose restrictions.

What does M. Sarrien propose to do about the recent discoveries made in New York by which long-distance telephony has been rendered so practicable?

M. Gillet, an inventor, declares himself able to put the whole world in telephonic communication by means of an instrument which he has constructed, and which, by the way, is not larger than a pocket time-piece.

At first, the whole scheme looked like a hoax, or rather like the project of an impractical man, but the very first exhibition demonstrated that the ingenious projector had foreseen, and was able to remove, all the difficulties standing in the way of its success. He has been furnished with facilities to use the postal telegraph of a Sunday between New York and Chicago [nearly 1,000 miles]. M. Gillet left for Chicago. There he attached his apparatus to the telegraph wire, and when the time arrived he conversed easily and clearly with his New York correspondent.

At the second attempt, made some days later, between Meadville, Penn., and New York [distance 400 miles], the same success was scored.

Again, M. Sarrien accords concessions for telephonic lines, though his predecessor took no pains to conceal the fact of his intention to bring back to the State an exploitation which is surely analogous to the telegraph. The facility with which certain persons obtain authorization by undue means, do not astonish us on the eve of election, but it appears to us that the new Minister of Posts and Telegraphs, should adopt, while there is yet time, a superintendence and supervision that will insure regularity.

If it is for the interests of the State, like his predecessor, that he is working, he certainly has discovered a queer way of showing his zeal, while if it is against these interests that he is working, he could not have more poorly demonstrated the fact than he has in the case of these Belgian patents.

THE ADVANCE OF THE STORAGE BATTERY.

No one familiar with the storage battery, and of the progress recently made in improving it, can be insensible of its great value and its wonderful possibilities when it shall have been perfected. Whether of the primary form or secondary form, the storage battery must be regarded as one of the most remarkable of modern discoveries.

The question whether the economical storage of electrical energy is likely in the future to be found in the primary or in the secondary battery, is naturally enough of great interest, but scarcely of pre-eminent importance, so long as found in the one or the other. But the only way the question can be determined, is through the work now happily progressing both in the one direction and in the other.

At first, as we knew, the improvement in the Plante design by Faure, and later on by Sellon and Volckman, almost created a stampede in that direction, and for a time, the primary battery, where the storage of large quantities of energy were looked for, was almost neglected.

Later on, however, the fine results had, with improved designs of this mechanism, opened the eyes of the electricians, and they or some of them, began to see in the possibilities of the primary battery the good they had been seeking. At the present time both the one and the other has many friends and believers, and it is under these conditions that the most is to be expected.

It would be a waste of time to recount to the readers of the ELECTRICAL REVIEW the progress that has been made in these storage batteries, because they are familiar with it They know that this progress long reached the point where both descriptions of battery could be used for furnishing a certain amount of power which could be readily utilized. But it is as yet a costly process, and save in cases where convenience rather than cost is considered, the storage battery can scarcely be regarded as of much commercial value.

Primarily, it may be said, that one of the most serious defects of the secondary battery lies in the rapid destruction of the sheet of lead used as anode, and it is with not a little satisfaction we learn that Dr. Kalischer has discoverd a means of preventing this. In a recent paper of his, read before the Physical Society of Berlin, he said that the means he employed in accomplishing this consisted in the adoption of a very concentrated solution of nitrate of lead as electrolyte, and iron as anode. He said:

The iron, on being immersed in the solution of lead, became passive, and resisted every corroding effect of the fluid; in other respects the peroxide of lead on the electric charge became deposited at the anode as a very firm, coherent mass, enveloping and protecting the iron on all sides. Charge was continued until the greater part of the nitrate of lead was decomposed, a condition which was marked by the occurrence of a greater development of gas at the anode. At the beginning of the charge all development of gas must be avoided, as otherwise the peroxide of lead, or, more correctly, the hydrate of the peroxide of lead, became covered with bubbles. As cathode a sheet of lead was used, but it was attended by two disadvantages.

In the first place, the lead, during the charge, separated itself at the cathode into long crystal threads, which soon passed through the fluid and produced short closing (of the current).

In the second place, the nitric acid, which remained in the fluid after the separation of the lead, acted very powerfully on the sheet of lead. Both disadvantages Dr. Kalischer avoided by amalgamizing the cathode. This accumulator of iron, concentrated solution of nitrate of lead, and amalgamized lead yielded, after the electric charge, which could be carried out without any special preparations, a current of about two volts; after about six hours' discharge, however, the electromotive force sank to 1.7 volts, but on the battery being left to itself for twenty-four hours, it became a little increased. According to the measurements hitherto taken, the functions of this accumulator were satisfactory. An attempt to substitute sulphuric manganese for nitric lead in this battery did not answer the purpose, as the peroxide of manganese separated itself, not in a continuous layer, but in loose scales.

It is not our intention to quote this as by any means a remarkable discovery, for such it is not. But it is a step in the direction of improvement, a rock in the base whereon at last the pedestal of successful accomplishment will be reared. When this great result shall at last have been reached, it will be possible and practicable to take the storage battery to the banks of a running stream, and there, by the interposition of the turbine wheel and the dynamo machine, it may be charged, and even the power which wheels it away to the place where it can most advantageously be used, may also be gathered at the same place and under similar conditions.

When that time comes, one of the pleasantest means of traveling short distances will be by means of the tricycle, the electric tricycle.

The account of a successful trial of the Faure storage battery, as a street car motor, published on page nine, will be of interest in this connection.

Fire broke out in the operating room of the Western Union Telegraph Company, at Philadelphia, Saturday morning. In a comparatively short time the entire room was gutted out—chairs, tables and instruments, including duplex and quadruplex instruments of considerable value, being destroyed. A handsome and valuable switchboard was also destroyed.

A telephone line has just been opened with considerable official ceremony between the city of Tixtla and Chilpancingo, Mexico, and other towns in the vicinity are to be connected shortly.

GENERAL WESTERN NEWS.

Two new places of amusement here are being wired with electric conductors. The Excelsior people are running lines for a 28-light arc plant at the new Panorama building on Michigan avenue, opposite the Armory, and close to the Exposition building. The power will be supplied by an Excelsior Iron Work's engine of 30 to 35 horse-power.

The lights with which to illuminate the panorama are placed in a circle above the heads of the visitors, and shielded from view by a projecting roof. The painting representing the battle of Shiloh, like all of this class of pictures, is circular, at a distance of 45 feet from the platform, which is also circular, and the optical deceptions are wonderfully marked. The artist so combines the actual with the canvas representations that one is very apt to be deceived in searching the line of demarkation between the two. The space between the round platform whence the painting is viewed is made ground, covered with verdure, trees, implements of war, etc., and earth. Across this is an actual track, made by passing wheels, for instance, and these marks are carried directly to the curtain, and continued in the painting, ending at a caisson or other vehicle, rendering the illusion complete, almost deceiving the very elect.

Another curious effect in optics is one due to uniformity in the proportions of the picture. Everything being carefully drawn to a scale, one has no idea of the real measurements of the figures, buildings, or trees in this class of paintings. Occasionally a night-flying butterfly, or large moth settles on the canvas, and assumes apparent dimensions which are truly huge. So, too, of remnants of every description lying on the made ground before the spectator. An ordinary cavalry sword looks large enough for a giant, and a musket appears nearly twice its natural size, by comparison with the figures on the painting.

Another curious effect is that of light and shade, modified by passing clouds, which change the amount and hue of the sunlight, which during the day sheds its rays more or less imperfectly through the illuminator over the center of the building. At times one would almost swear there were clouds passing over the gory field, the very track of which seems apparent.

The Chicago Opera House is being wired by the Edison people, and the job is not an easy one, by any means. The building is claimed to be critically fireproof, which renders the avoidance of iron, and mortar, and brick, and tile a matter for considerable ingenuity on the part of the wire men.

The building is calculated for a seating capacity of something over 2,000 people, and will be lighted in the first instance by about 600 incandescent Edison lamps—or, as they were named a few days since by a visitor at McVicker's theater, who was communicating information to a country friend, "incanedisent lamps.

As we already have the Grand Opera House, and the Chicago Opera House is so near upon us, some little speculation is indulged in as to possible confusion in designating the two Thespian temples. The former is now colloquially known as the "Grand," so that probably the new one will shortly come to be the "Chicago," which may resolve the problem satisfactorily.

The Chicago Opera House will be opened on the 15th of August, the panorama of Shiloh on the 1st proximo. The manager of the latter exhibition, an Eastern gentleman, Mr. Bond, was formerly connected with telegraphic enterprises in and around Missouri and Illinois, and, though for some time out of the business, well remembers the olden days of the business.

Speaking of old timers, a call on the chairman of the committee on Early History of the Telegraph, W. R. Plum, Esq., a day or two since, found him busy as a town-gossip making up his work for the Old Timers' Convention. Quite a pile of reminiscences were the results of his gleaning among the old boys of the past, and he predicts a lively and interesting time at the coming reunion.

The old boys, the pioneers of the key, are fast passing away, and if each would contribute his mite to the past history of the art, in his own way, the humorous or the serious, the scientific or the nonsensical, out of the mass so gathered a very readable and entertaining, as well as valuable, book could be edited, with but slight labor; and, if allowed to make the suggestion, this should be done before it is too late, by Plum, or some other equally competent person.

From the fact that every telegraph veteran met in the street asks the same question, "Have you heard from Plum?" it may be inferred that he is doing his work quite systematically and thoroughly.

The invention of the life-saving apparatus for electric light employes, which consists of a conductor from the two hands, down the back and to ground at the feet, has stimulated another inventor, who suggests lightning-rods for umbrellas, with a trailing ground wire. If this thing goes much further we shall have rods on all our horses and carriages, plug hats and bonnets will be made lightning-proof in the same manner, and the lightning rod men will invade our nurseries to rod the cradles of the rising generation. There is such a thing as too much lightning-rod protection.

We complain in this country at the tardiness of our Patent-Office, but, in some respects, our French friends have been in a far worse condition than we. For instance, according to M. Tresca, of the Academy, the French Patent Office Report has not been published annually, but had fallen back, until, in 1871, the patents of 1860 were still unpublished.

To remedy this defect, the committee to whom was entrusted the devising of a remedy, arranged for the publishing of two reports annually, one of which was for the current year, the other the oldest on the docket. The whole has at last been nearly completed, and the publication is now but three or four years behind the office work. One can hardly imagine the effect of a similar delay in the United States. The ten years' transactions of the French Patent Office from 1871 to 1880 fill 57 large volumes.

Somebody has lately published with considerable *eclat* the fact that glass tubes may be cut by the heating effect of a battery in a wire wrapped closely around the tube, and then suddenly plunging the same into cold water. It certainly will do the work, and especially if a slight scratch with a file is first made at a point in the proposed cut. There used to be a recipe published in the "Boy's Own Book," for doing the same thing by means of a woolen string saturated with turpentine, and set on fire. Many a trial of this so-called trick resulted in burnt fingers and other disappointment in the young days of your correspondent, but never was a case of success recorded on the tablets of his memory. The other plan has as seldom failed in later life.

W. H. Preece, whom all know as a gentleman in science as well as in private life, has been awarded a silver medal by the London Society of Arts for his recent papers on electric lighting.

A gentleman of this city, who was in a Wisconsin town during the tornado, cyclone or what not which recently struck the place, describes the scene quite graphically. Among other sufferers was one whose barn was lifted up and carried entirely away, broken up and left a remnant, something like two miles distant. The astonishment and vexation of the owner were much aggravated by the fact that he had but just finished repairing the edifice. His feelings found vent in rather strong language. Said he: "I just put seventy-five dollars in repairs on that barn, and now I can't find a blank bit of it." Trees, buildings, almost anything which stood up before it were swept away instantly. The jolliest thing, however, in a cyclone is said to be a pile of boards. They peel off like leaves torn from a book, and go flying through the air like newspapers.

The 16th of July was another red-letter day for storms. This time Dakota took a hand in the muss. At Highmore a cyclone wrought disastrous results; buildings, trees, crops and human life were caressed by the ruthless hands of the electrical monster, and at Holabird, in the same general locality, the cyclone nearly blotted out the settlement. Reports from Grand Forks and Jamestown, Dak., tell of the force of its fury, and a Sioux City, Iowa, correspondent says at a point near Highmore, Mr. E. B. Thompson was carried forty rods, and his neck broken.

Farther south the country was ravaged by a severe hail storm, and at Manuel the cloud parted, one portion passing to the southwest, the other going over into Minnesota. Here it struck through Polk county, and across the southern part of the State, leaving devastation in its path, but assumed more the character of a violent thunder storm or hurricane than of a cyclone in its transit.

Owatonna, Blue Earth City, Brainard, and other towns in Minnesota, Dubuque, Iowa, Galena, Lanark, and other places in this State, all chronicle storms simultaneous with the above, and some portions of Wisconsin also felt the furies of the elements. Every correspondent speaks of the unusual fury of the storm, the heavy fall of rain, the loudness of thunder, and the constant vivid flashes of lightning.

Chicago, July 23d, 1885.

SETTLEMENT OF THE TELEPHONE TROUBLE AT INDIANAPOLIS.

The officials of the Central Union Telephone Company and the Subscribers' Committee have finally reached the following agreement:

To the Public and Contesting Telephone Patrons:

The Central Union Telephone Company and the committee representing the contesting patrons have reached a settlement of the pending controversy. The result has been brought about by mutual concessions, and the wish on the part of each to abate the existing agitation and restore the status of both company and patrons prior to July 1.

The new law takes effect in about one month. The company desires to contest its constitutionality, and obtain a judicial interpretation of its language. It will co-operate with the committee in the presentation of a test case, involving the several questions, to the Supreme Court of this State, and the view of that court will be secured as promptly as possible. It is believed this will not require longer than October 1, the end of the present quarter.

It is conceded by the committee that the company has the right to take the view of the court respecting the new law; and, to enable it to do so without too great a disturbance of its relations with its subscribers, it is mutually agreed that the old contracts (which are the same in matter of details as the new ones recently issued, excepting the rental apportionment clause) shall be issued to contesting subscribers, and that there shall be indorsed thereon the following features (which are set out at length in the agreement between us):

1. The company's rates are uniform in this city, and regulated by distance and class of service.

2. The charges are based on a separate rental for the telephone, service, etc.

3. If the new law is held invalid, the company is entitled to the rates named in the contract, which are those prevailing heretofore. If the law is held valid, but to warrant the company's claim for service, material, etc., the sum in excess of the statutory rates is to be deemed due to the company.

4. The company is to defer collections until the middle of the quarter, and to forthwith refund all moneys paid in excess of what may be judicially declared legally due by our Supreme Court.

5. It is distinctly understood that the subscriber does not, by signing the contract, admit or acquiesce in the company's claim that the new statute permits a charge for service, material, etc., in addition to the statutory telephone rental, and that the above clause, numbered 2, apportions the rental solely for the purpose of enabling the company to present the legal question to the court. The old contract blanks, with the above additions indorsed thereon, will be at once supplied to each of the contesting subscribers for signature, and thereupon the telephones removed will be at once restored. Payments heretofore made by withdrawing subscribers on the current quarter will be credited on the rental, due August 15. The company will, on request, indorse the five stipulation above referred to on all the new contracts heretofore issued and accepted by the non-contesting subscribers of this city and State, or will substitute the old contracts with the above indorsements, and will voluntarily refund to all subscribers the excess of charges when adjudged illegal. The above arrangement practically restores the harmony existing prior to the commencement of the present trouble, and removes the chief exciting cause. The committee will prosecute the duty of properly supporting the new statute in the courts and prepare for its presentation in the test case.

CENTRAL UNION TELEPHONE COMPANY,
By F. G. BEACH, General Supt.
JOHN W. MURPHY,
L. S. AYRES,
J. E. SULLIVAN,
R. O. HAWKINS,
JOHN A. HOLMAN,
Managing Committee.

The business of the company is assuming its normal condition. A large force of men have been engaged replacing instruments, where they had been ordered out, and little or no opposition has been offered to this, thus far. In a general way, it can be said that the agreement made gives general satisfaction to the subscribers and this fact is so evident that the committee have decided that it is not necessary to call a meeting of the patrons to take formal action. The general feeling on the street, however, is that the committee have done excellent work, and that both they and the company are to be congratulated upon the amicable adjustment of their differences. The new form of contract agreed upon is being put in circulation. The committee will hold another meeting to consider the subject of a test case, it being their intention to employ such counsel and take such steps as will result in having the views of the subscribers and their rights intelligently presented to the Supreme Court.

Editors of the Electrical Review:

In your Telephonic News, a week or two ago, the Lawrenceburg and Aurora (Indiana) Company is credited with exemplifying "a new theory in electrics" by grounding one wire of a line at every fourth pole, in the hope that the remaining wires might be relieved of the "great induction" by "collecting the escape" and "carrying it to the ground." If the writer of the paragraph in question will consult the annals of the American Bell Telephone Company, he will unearth the fact that as long ago as 1879–80 this plan was given very careful trial on the lines of the Interstate Telephone Company between Boston and Providence, and on those of the Brockton Company between that place and Boston. On the former a "dead wire" was run the entire length of the line, with a ground connection at each pole, and branches along each cross-arm, connecting with metallic sleeves completely surrounding the base of each pin. The only effect was to bring the ground within three inches of the line wire, instead of twenty-five feet or more, and, by increasing the escape, impair the usefulness of the conductor. Realizing that they had attacked the problem at the wrong end, the company cut away their "anti-induction appliance," which the superior wisdom of some "electrician" had dictated, and came to realize that "induction," *per se*, was accountable for very little of their trouble, and that, if they would utilize the largest percentage of their current energy in their instruments and escape interference, they must take more pains with their insulation—in other words, keep the earth as far from each wire (electrically), and each wire as far from its neighbor, as consistent with a reasonable economy in construction—and increase the conducting capacity of their circuits by the use of larger iron or copper wire, and by soldering the joints. The Lawrenceburg people are on the right track. Now let them look to their insulation and their terminal ground connections, and they will attain a minimum of interference by leakage. It is always well in this connection to remember that a two-wire line offers the severest test of telephone insulation; with a larger number, the early difficulties grow less noticeable. ELECTRO.

New York, June 16, 1885.

Telephonic News

⁂ The telephone is being introduced in Tangier, and rival companies are being formed.

⁂ The Pan-Electric Company have filed a bill against the American Bell Telephone Company in the United States Circuit Court, at Memphis, Tenn. The bill contains eleven items.

⁂ A telephone wire loosened by the storm fell across a wire from the generator, and became so strongly charged that it instantly killed a dog that had essayed to play with it. To replace the wire it had to be cut, as the dead canine's mouth could not be pried open.

⁂ The telephone between Sprague, W. T., and Harrington, the center of the Big Bend country has been connected. The wire extends twenty-three miles. The intention of the manager is to extend the line to Camp Spokane, Grand Coolee, Brents and the Columbia river.

⁂ In a Western city a new patron of the telephone wrote to central office for his telephone number a few days after his instrument had been put in. The force of habit was so strong that it didn't occur to him to use his telephone—talk to "central"—and find out in one minute what he had to wait two days for the mail to bring.

⁂ The American Telephone & Telegraph Company, has placed an order for over 100,000 screw top insulators with Lytle & Co., the general agents for this new insulator. These will be used in the long line construction of the American Bell Telephone Company, which is organized under the above name. The screw top insulator is being used largely by telephone and telegraph companies, the Western Electric Company having ordered over 200,000 for its patrons, and the New England Telephone Company 50,000.

⁂ Several patents have been taken out for telephones working by the attraction between parallel currents. One of these has recently been brought forward by Mr. Theodore Taylor, of New York, and the apparatus exhibited. It consists essentially of a copper wire of No. 26 gauge, bent into two spirals in parallel planes, and attached to vibrating plates, the whole being enclosed in a box with a mouthpiece. Plates or linings of soft iron in the box help to increase the effect. Mr. Taylor states that a battery of from four to thirty Fuller cells, according to the length of the telephone line employed, is sufficient to work his apparatus. His English patent is dated 1884, but other patents dated 1882, and embodying the same principle, are said to be in existence.

⁂ The subscribers of the Worcester Telephone Exchange are very much interested in the reconstruction of the lines and instruments in that city. The work is going on under the direction of Mr. Paul W. Bossart, Superintendent of the Worcester Division of the New England Telephone and Telegraph Company. He has received 4,000 feet of 50-wire cable to be used in the central part of the city, and thus do away with the network of wire now on many of the poles. Six car loads of heavy poles have been received, and ten car loads are on the road. The plan now is to expend from $12,000 to $15,000 this season on the Worcester Exchange and immediate connection. Mr. Charles M. Davis, who has the charge of the Worcester Exchange, has sent out over 100 new boxes since the reconstruction order was issued. He has two inspectors at work making the changes, and the work will be kept up until all poor instruments and circuit call bells are removed, and magneto call bells substituted. As soon as the right of way can be secured in the towns in the Worcester Division it is proposed to build a copper wire line between that city and Boston, which will make the third between the two cities.

⁂ The Messrs. Searls, of the Relay House, gave the telephone operators of Lynn, Mass., an excellent dinner one day last week, complimentary to the good service they render subscribers.

⁂ The departure of Theo. N. Vail, O. E. Madden, and Geo. L. Phillips from the front rank of telephone interests marks a change that will be felt wherever the telephone is known, and will have a decided effect on the future of these interests. Mr. Vail goes to Europe soon, and will enjoy a rest of several months. As he is largely interested in storage battery matters, the points to be learned in this connection in Europe will no doubt receive his attention.

The Life of Telephone Poles.

"Have you any idea how long one of our poles lasts?" asked Captain George N. Stone, of the Cincinnati Telephone Company, recently.

The *Times-Star* reporter confessed ignorance. He had noticed the replacing of a number of telephone poles by new ones, and sought to ascertain the wherefore.

"Well, you will be surprised, I expect, to learn that a first-class pine pole will last only four or five years. We had the finest line of pine poles in the world put in on Auburn avenue, Mt. Auburn, four and one-half years ago, and now they are played out. These poles were seventy-five feet high, and measured eighteen inches at the butt, and cost $25 a piece, and now they have to be replaced with new ones. First, the sap in them rotted and we had to have extra long steps made for them, then they rotted at the bottom, and now they are of no account. Rather discouraging, ain't it?"

"You use cedar poles too, don't you?" was asked.

"Yes, and they last longer. A white cedar will last from ten to twelve years, and a red cedar about twenty-five years. So you see that there must always be a constant repair, or a telephone plant will go to pieces. Our wires, too, wear out, more so in some localities than others, and, of course, have to be renewed. I have wires upstairs all rusted so that the pure wire remaining is not thicker than a hair. The sulphur that fills the air of manufacturing districts is very bad on our wires. Since this company was first started, the whole plant of poles has been made over two and three times."

"How many poles belong to your company?"

"I don't know that, exactly; but we have 247 miles of poles in this county, and some outside, and there are about thirty-five poles to the mile, so that you will see we have to provide and keep in order not less than 8,700 poles."

Are the Telephone Patents Valid?

The article in another column questioning the validity of the Bell telephone patents is worthy of careful perusal. The victories which the American Bell Telephone Company has achieved over the Drawbaugh and other competitors have built up an erroneous impression that the vital claims of the Bell monopoly have been legally established. The lengthy review of the subject elsewhere on this page is calculated to disprove that impression, and extend hope to the public and the inventor, that the Colossus which now bestrides the whole field of transmission of speech by electricity may yet be shorn of some of its power.

The grounds for believing that a field of usefulness is still open for meritorious inventions in telephony may be summarized as follows:

First. The cases against the Drawbaugh and other competitors have hitherto been fought mainly upon the question of priority of invention. The Bell Company has made free use of political influence. The Judge appears to have been a stock operator himself and does not possess the highest reputation as a jurist. And none of these cases have yet been adjudicated by the United States Supreme Court.

Second. There is believed to be a wide disparity between the claims made in the Bell patents and the actual instruments upon which those claims are based. In brief, Prof. Bell claims an exclusive right to use a method and process which he does not appear to have described or invented, and therefore could not describe when he obtained his patent.

Third. The most-sweeping of the Bell Company's claims, and one upon which its monopoly is based, is broader than the law allows. This latter fact seems to be conclusively proven by the discussion in regard to the eighth section of the Morse telegraph patent cited in our article elsewhere. The most vital issue in the telephone cases has never yet been argued.

It cannot be possible but that the Wallace, or some other competing telephone company, will have the courage to test these legal questions in the immediate future.—*Boston Commercial Bulletin.*

The Telephone Patents.

The Boston *Commercial Bulletin* contains the following concerning the telephone patents and the recent decisions:

"Because the Bell Company has been thus far uniformly victorious in its patent suits in the United States many people suppose that its claim to a monopoly of the transmission of speech by electricity has been fully sustained by the courts.; but such is very far from being the fact.

"The question at issue in the Drawbaugh case was priority of invention, and the validity of the Bell patents *per se* was not entered into. The Bell Company has also made free use of political influence in all of its legal contests, and none of its suits have yet been carried to the United States Supreme Court.

"It is very confidently asserted that, if an action is brought to determine the soundness of the fourth and fifth claims of the Bell patent, by which the Bell Company seeks to control the whole business of transmitting speech by electricity, that portion of the patent will be declared to be broader than the law allows.

"These clauses of the patent upon which the Bell Telephone Company maintains its monopoly are as follows:

"4. The method of producing undulations in a continuous voltaic circuit by gradually increasing and diminishing the resistance of the circuit, or by gradually increasing and diminishing the power of the battery, as set forth.

"5. The method of and apparatus for transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth.

"It is argued that the undulations in question do not merely accompany the sound. They *are* the sound, or what our ears recognize as such; and the transmission of sound and speech by electricity is not patentable. The validity of

SO BROAD A CLAIM

as that made in the above sections of the Bell patent was demonstrated in the celebrated case in which Prof. S. F. B. Morse attempted to sustain a patent upon the 'motive power of the electric or galvanic current.' The eighth section of the Morse patent was as follows:

"*Eighth*—'I do not propose to limit myself to the specific machinery, or parts of machinery, described in the foregoing specifications and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed, for marking or printing intelligible characters, signs or letters, at any distances, being a new application of that power of which I claim to be the first inventor or discoverer.'

"In disallowing this claim, the United States Supreme Court used language which is clearly applicable to the similar claim in the fourth section of the Bell patents. It said that if such a claim could be maintained, some future inventor, in the onward march of science, might discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated, less liable to get out of order, less expensive in construction, and in its operation. But yet, if it is covered by Mr. Morse's patent, the inventor could not use it, nor the public have the benefit of it without the permission of Mr. Morse. The Court used the following additional language in this case:

"DECISION OF U. S. SUPREME COURT.

"'No one, we suppose, will maintain that Fulton could have taken out a patent for his invention of propelling vessels by steam, describing the process and machinery he used, and claimed under it the exclusive right to use the motive power of steam, however developed, for the purpose of propelling vessels.'

"The Court further held:

"'The provisions of the acts of Congress in relation to patents may be summed up in a few words:

"'Whoever discovers that a certain useful result will be produced in any art, machine, manufacture, or composition of matter, by the use of certain means, is entitled to a patent for it, provided he specifies the means he uses in a manner so full and exact that anyone skilled in the science to which it appertains can, by using the means he specifies, without any addition to or subtraction from them, produce precisely the result he describes.

"And if this cannot be done by the means he describes the patent is void, and if it can be done, then the patent confers on him the exclusive right to use the means he specifies to produce the result or effect he describes, and nothing more. And it makes no difference in this respect, whether the effect is produced by chemical agency or combination, or by the application or discovery of principles in natural philosophy known or unknown before his invention, or by machinery acting altogether upon mechanical principles. In either case he must describe the manner and process as above-mentioned, and the end it accomplishes. *And any one may lawfully accomplish the same end without infringing the patent, if he uses means substantially different from those described.*"

"The above decision, therefore, seems to effectually controvert the Bell Company's pretensions to exclusive property in everything that pertains to the telephone—the mode of its operation, the use of the element of electricity, and every possible method of its application for the transmission of articulate speech.

"WHAT PROF. BELL DID.

"Moreover, in an opinion recently written by Hon. L. S. Fairbanks, now of this city, it is argued that, while Prof. Bell's telephone patent was granted to him March 7, 1876, his first successful transmission or speech was made subsequent to March 10, or at least three days after the date of the first patent, and that even then, Prof. Bell used a liquid transmitter made for him from a description of Elisha Gray's apparatus in his caveat on file in Washington.

"If the facts set forth are correct the plan upon which the Bell specifications were drawn seems to have been to make them broad enough to cover the whole art and science of transmission of speech, and then subsequently invent or otherwise obtain the requisite processes and mechanical appliances. As has been said in regard to the matter by one lawyer, 'when he drew his specification, he drew it as the hunter shot at the game, so as to 'hit it if it was a deer and miss it if it was a calf.'"

"Prof. Bell was preceded in the invention of the telephone by Chas. Bourseul, a soldier in the French army in Africa in 1854. His plan as suggested and published in that year, was almost an exact outline of an electro-magnetic transmitter and receiver, similar to the apparatus first patented by Prof. Bell. But the first inventor of an apparatus that was capable of transmitting spoken words, was Philipp Reis, of Germany, in 1860, and he was also the inventor of the name 'telephone.'

"Reis's achievements are of far more value to contestants against the Bell patents than they have been generally led to suppose. In

summing up the evidence which he adduces in the pamphlet referred to, Mr. Fairbanks says:

"'Prof. Bell made certain improvements in this art, if it can be strictly called an art, and should have the credit for, and emoluments thereof. But even if he wrought out his plans as an independent and original inventor, his work was only one step in the progressive development of the telephone. He may be called an original inventor, but he cannot be justly regarded as the original inventor of the instrument and of all that pertains to it; and the law is clear that, being only a factor in the work of perfecting the invention, he cannot monopolize all previous discoveries as well as have a blanket mortgage on all subsequent inventions.'

"OTHER LEGAL DECISIONS.

"In support of these views the following legal decisions are cited:

"'A party not being the original inventor of a machine, but the patentee of only an improvement for a combination of mechanical devices, cannot hold as an infringer one who has used only a part of the combination. The inventor of the first improvement cannot invoke the doctrine of equivalents to suppress all other improvements which are not colorable invasions of the first.'—McCormick vs. Talcott *et al.*, 20 Howard, 405.

"'A person who invents a new machine, never used before, and procures letters patent therefor, acquires a monopoly as against all merely formal variations thereof; but if the advance toward the thing desired is gradual, and proceeds step by step, so that no one can claim the complete thing, each inventor is entitled only to his own specific form of device.'—Railway Company vs. Sayles, 97 U.S., 554.

"'The application of an old process or machine to a similar or analogous subject, with no change in the manner of application, and no result substantially distinct in its nature, will not sustain a patent, even if the new form of the result has not been before contemplated.'—Penna. R R. vs. Locomotive Truck Co., 110 U.S., 490.

"It is evident, therefore, that a contest may yet show the invalidity of the original Bell patent, and seriously curtail the broad claims which have been made under it.

"The recent case of the Bell Telephone Company against the Molecular Telephone Company before Judge Wallace, brought forth some interesting bits of testimoney regarding the performances of

THE REIS TELEPHONE,

whose claims to have been the actual inventor of the art of telephony, as he was of the name, are most strongly supported. The Bell people claim that his instruments could not speak, and if they could by improvements be made to, that at all events Reis had no idea of making that claim. In contradiction of this assertion there is the statement made by Reis himself in a lecture delivered in 1860, when he said: "I have succeeded in constructing an apparatus with which I am able to reproduce the tones of various instruments, and even to a certain extent the human voice.' Not indeed, 'with a distinctness sufficient for every one. The consonants are, for the most part, reproduced pretty distinctly, but the vowels, as yet, not in an equal degree.' One of the witnesses says: 'When the news of the Bell telephone first reached Dublin, I had a conversation with Mr. Farley, * * and he stated to me that in the year 1865 he had distinctly heard the Reis telephone talk.'

"Another witness said:

"'The (Reis) telephone was first shown to me by Mr. Stephen Yeates at a meeting of the Dublin Philosophical Society, held in November, 1865, at his brother's, Horatio Yeates, 13 Leicester Street, Dublin. He explained its construction and some modifications which he suggested and carried out. The transmitter was taken up stairs to a room and the receiver placed in the hall, where I heard the voices of different speakers and recognized them. I also heard portions of musical airs, of which I recollect "Home, Sweet Home," "Jump Jim Crow," and "God Save the Queen." The sentences were short, such as, Who am I? Do you hear me? Who is speaking now?'"

That Pittsburgh Decision.

The *Scientific American* speaks editorially of the Pittsburgh decision in the telephone suit as follows:

"The latest phase of the telephone litigation was developed at Pittsburgh, Pa, July 8, in the United States Court, before Judge McKinnon, in the suit of the Bell Telephone Company against the Western Telephone Company, for infringement and injunction. The court permitted the counsel for the Bell Company to occupy almost an entire day with their argument, but refused to hear any reply on behalf of the defence, although they were prepared to prove that their invention was substantially the same as that used by Reis, many years prior to Bell's alleged invention. At first the court was inclined to hear of this matter, as the issue hinges entirely upon the question whether or not the Reis transmitter will transmit speech regardless of the kind of receiver used; but finally it refused to hear evidence, allowing that to go over to the final hearing. The court, however, held that the questions at issue had been decided recently by Judges Gray and Wallace, and that it would not, in the matter of a preliminary injunction, venture to decide contrary to the opinions of those eminent jurists.

"The practical effect of this decision is that the use of the Reis telephone is an infringement of the Bell patent—a position which we have expected the lower courts would sooner or later take, since in no other way can the gigantic Bell monopoly be upheld. The moment justice is done, and the use of Reis' invention allowed, the patent of Bell will be reduced to its proper rank—that of a subordinate improvement. None of the Bell telephone litigations have reached decision by the Supreme Court If the latter tribunal deals with the Bell patent in the same manner that it has with other wide-reaching monopolies, the claims of the Bell people will, in due time, be greatly modified."

.... The Eastern Telegraph Company announce the re-establishment of communication, *via* Suez, with India, China, and the Far East, by the repair of their Aden-Bombay Cables.

.... Justin McCarty, by his attorneys, Messrs. W. S. Abert and J. W. Warner, has entered suit against the Western Union Telegraph Company, to recover $4,101, claimed to have been lost through the neglect of the company in not delivering a telegram promptly, whereby he failed to receive a contract on a Government building at Terre Haute, Indiana.

.... Several weeks ago the parties interested in the injunction suit of the Gold and Stock Telegraph Company *vs.* the Commercial Telegraph Company came to an agreement. Recently the lawyers for both sides appeared before Judge Shipman in Hartford, and asked for a further disposal of the case. The defendants claimed that the plaintiffs were doing their utmost to drive them out of the stock exchange in New York city, and were endeavoring to break up their business The judge declined to act at present. In the meantime the defendants are permitted to make new instruments in exchange for old ones, but are not allowed to make contracts for the use of instruments with new parties. A bond was given by defendants.

.... All the wires of the Bankers and Merchants' Telegraph Company at Albany, N. Y., were cut a second time by the Western Union at 3 o'clock in the morning After they were cut Friday night the Bankers' obtained possession again and held them during the day. Guards were placed at the pole where the connections were made, so that the Western Union could not approach. Early the next morning, however, the guards were caught napping, and a Western Union employe quickly climbed the pole and cut the wire into the office. Two watchers sat astraddle the crossbar all day and during the night to prevent the Bankers and Merchants' from again securing the lines. The office of the latter company has been closed.

.... The Watertown *Times* says a scheme has been broached in that city for the formation of a stock company to purchase the Bankers and Merchants' wire running from Syracuse to Ogdensburg; for the transaction of purely local business at a low system of rates. The plan is said to be looked upon with favor by local capitalists.

.... At the annual meeting of the Financial Telegram Company, of Boston (controlling the Field tickers now operated in opposition to the Gold and Stock Ticker service), the following-named Board of Directors were elected: Bainbridge Wadleigh, John W. Candler, George C. Barrett, R. F. Straine, H. E. Wellman, Charles E. Jackson, George D. Eldridge, John Anderson, Stephen D. Field; president, R. F. Straine; treasurer, George D. Eldridge. Arrangements have been made for starting up the business of the company in Boston, and its operations will be actively pushed.

.... A sweet young thing went up to a telegraph counter in England with a form in her hand and a diffident look in her face, and inquired, "Can't I send just one word for less than a shilling?" "No, miss," replied the clerk, "the rate is a shilling for one word or twenty; but if you are in no hurry, and are willing to wait until August, the rate will be cheaper." "Wait until August, indeed. You don't know the scarcity of husbands, young man. You see," she went on confidingly, "dear George has proposed to me by letter, and I want to secure him, as it were, before he has time to change his mind." But the Government has not any consideration for engaged young ladies, and the sweet young thing had to secure George at an outlay of a shilling.

.... At a meeting of the incorporators of the Pacific Telegraph Company, held in Wyandotte, Kas., the following officers were chosen: E. L. Martin, of Kansas City, president and treasurer; E. S. Stokes, of New York, vice-president; George M. Meyers, of Kansas City, secretary; L. D. Parker, of Chicago, auditor. The capital stock of the company is $300,000. The majority of the stock has been subscribed in Kansas City and Omaha. Wyandotte, Kas., will be made the headquarters of the company. This new telegraph line is to be built from St. Joseph to Omaha, Neb., *via* Marysville, Kas., and Lincoln, Neb. The work of construction will commence at once, and the line will be in operation between St. Joseph and Omaha by October 1.

.... In the case of the Western Union Telegraph Company *vs.* Heysers, the appellees recovered a judgment against the telegraph company for the sum of $122.50 as damages for failing to transmit a message ordering certain machine attachments for a reaper and binder. It was shown on the trial that, by reason of the failure of the company to deliver the message, the appellee's machine was idle for several days, during which time their wheat crop was greatly damaged, the appellees being unable to harvest the same with their imperfect machine. The evidence further showed that the appellant was fully informed of the importance of the message, and of the injury likely to arise if delivery of the same was delayed. The Texas Court of Appeals held this evidence ample to fix negligence upon the appellant and to sustain the judgment.

.... The *Scotsman* says: "Only a few years ago it was the height of rashness or of heroism for an infidel to set foot in Mecca. Burkhardt and Burton won their spurs by venturing, in the disguise of pilgrims, within the most sacred city of Islam. The telegraph has changed all that. Mecca, in spite of its triple protection of desert mountains, robber tribesmen and Mussulman fanaticism, is about to go down before the post of the telegraph constructor. In a few weeks the birthplace of the Prophet will be in direct communication with the newsmen of Fleet street, London. Messages will be sent and delivered within a stone's throw of the rock which fell from heaven to mark the site of Paradise and of the sacred well which has for so many centuries distributed religious influences and the germs of cholera morbus among the Faithful.

TELEGRAPHIC

.... Electric lighting is quiet in St. Louis and other Western cities at the present time, but the fall prospects are unusually good.

.... Harrisburg, Pa., is in favor of having the Baltimore and Ohio Telegraph Company open an office in that city, and this will probably be done.

... Atlanta, Ga., would put in an electric fire alarm system if it knew which system was the best. Two are being tested at the present time.

.... Japan already counts her telegraph stations by the hundred, and talks of running a wire to the sacred summit of Fusiyama for the purpose of telegraphing weather observations.

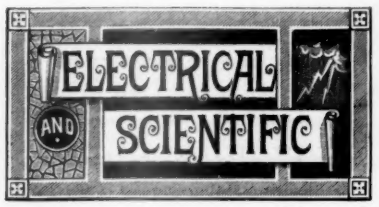
.... B. L. Allen, superintendent of the Providence District Messenger Co., has introduced a system of calls and signals into his city for the use of the city officers, that is giving great satisfaction.

.... The certificate of incorporation of the Empire and Bay States Telegraph Company was filed Friday. It has a capital of $250,000, with the right to increase it to $10,000,000. Its corporators are Andrew J. Baldwin, John Henry Miller, and Charles Marsh. The company is to carry on its operations in this State, Connecticut, Rhode Island, Massachusetts, New Jersey, Pennsylvania, Maryland and Washington.

.... It is reported that all opposition to the Western Union Telegraph Company acquiring the American Rapid Telegraph Company is at an end. The statement is made that the transfer of the latter-named to the former is to be under an arrangement by which the Western Union practically guarantees 6 per cent. on the American Rapid Company's bonds. It is also stated that negotiations are on foot to get all the cable lines under one management.

.... The *Mail and Express* says: Western Union has been active and strong on the acquisition of the American Rapid lines, to which we alluded yesterday. An attempt has been made to put the course pursued by Western Union in a bad light. The facts are that the company was authorized under an order from Judge Donohue to take possession of the American Rapid lines. Opposing interest had made up a plan for the purpose of causing delay and preventing Western Union from gaining possession except by litigation. Western Union cut the difficulty and the wires at once by peremptorily taking possession. There are intimations of other occurrences likely to result favorably to Western Union within a few weeks. It is reported that the American cables will be announced in working order within a few days' time.

.... The Atlantic Telegraph Company, incorporated under Maine and New Hampshire laws, with a capital of $100,000 has been organized. The new company which is owned by Boston and New York capitalists, will not extend its wires beyond New England. The gentlemen interested are president, John W. Deering; treasurer, John J. Donovan; superintendent, Edward A. Leslie; directors, John J. Donovan, ex-mayor of Lowell, Mass.; Nathan D. Pratt, city solicitor of Lowell, Mass.; Edward A. Leslie, superintendent Baltimore & Ohio Telegraph Co.; Thomas G. Gerrish, Jr., Lowell, Mass.; Payson Tucker, vice-president Maine Central Railroad, Portland, Me.; George F. Owens, ex-mayor of Saco, Me.; Wm. S. Dennett, superintendent Saco Water Power Co., Saco, Me.; John W. Deering, mayor of Portland, Me.; Stephen I. Abbott, manager Waterville Mfg. Co., Waterville, Me.; Parker C. Chandler, counsel Baltimore & Ohio Telegraph Co.; Francis Jewett, ex-mayor of Lowell, Mass.; Geo. P. Westcott, ex-mayor of Portland, Me.; Weston Thompson, attorney-at-law, Brunswick, Me.



* * German photographers are now making excellent photographs of lightning. The extraordinary manifold ramifications of the lightning are beautifully represented by means of the gelatine plates.

* * Two Troy men have invented a machine which, it is claimed, will practically revolutionize match-making. It has been operated to make 24,000 matches in a minute, and its capacity is expected to reach 15,000,000 in ten hours.

* * Miss Adele Field, in a communication made to the Academy of Natural Sciences of Philadelphia, reports that the common earth worm, after its head has been cut off, has the power of regenerating the whole of the dismembered portion. She recounts her experiments with such minuteness of detail as seems to show that error in her conclusions was impossible.

* * The deepest boring yet made is at the village of Schladebach, near the line between Leipzig and Corbetha. It has been made by the Prussian Government to test for the presence of coal, and was bored with diamond drills. Its depth is 1,390 meters (4,560 ft.); its breadth at the bottom, 48 millimeters; and at the top, 280 millimeters. It has occupied 3½ years to bore, and cost a little over £5,000. The temperature at the bottom is 48° Cent.

* * At present the Rothschild family control the quicksilver supply of the world, but a new mine has now been found at Schuppiastena, near Belgrade. There are only a few quicksilver mines known, the two largest being in Spain and California. Both are owned by the house of Rothschild. The yearly consumption of quicksilver is cut down to 100,000 bottles, the larger part of which comes from California, while Spain furnishes about 10,000 bottles.

* * T. C. Frenyear & Co., 45 Milk street, Boston, are manufacturers of luminous electric goods, particularly push buttons and pendants. The advantage of being able to light the gas or ring a bell in the night at once, without fumbling round in the dark for matches or buttons, is, of course, patent to every one. This company should turn its attention to the manufacture of luminous key-holes if it desires to fully appreciate what the American public specially demand. A "long felt want" would then be filled.

* * The Board of Directors of the Electric Railway and Power Company of St. Louis have elected the following officers: President, Edwin Harrison; Vice-President, John Jackson; Secretary and Treasurer, Charles Hoyle; General Manager, Wellington Adams. The company will immediately begin erecting its lines for the general distribution of electric power for various manufacturing, professional and domestic purposes; and at the next session of the Municipal Assembly will present an application for a franchise granting a right of way for the proposed elevated electric railway.

* * At Hampden Hall, in Hampden, near Baltimore, where the Daft motor is being tried, three horses which had been turned loose to graze on the village green crossed the car-track. One of them, owned by N. A. Cornelius, which was old and infirm, stumbled and fell directly across the center rail, which is charged with electricity, and instantly died, whether from old age, or the fall, or electric shock was not clearly proven. There seems to have been a desire to at once admit that the electric motor could knock out a horse every time, and Mr. Cornelius was promptly permitted to select a fiery, untamed steed from the street-car company's stable, which will be fenced off from the track in the future, for fear he will stumble over the third rail and break his neck or be paralyzed by the electric current.

Electric Storage Batteries as Street Car Motors.

BALTIMORE, July 17, 1885.

Editors of the Electrical Review:

A successful test and demonstration of the storage battery, as a motive power for city passenger railways, was made on the Union Railway, in this city, on Tuesday last. The Union Company have the Daft system in operation on the suburban branch of their road between Baltimore and Hampden—about two miles.

This road passes through one of the most hilly sections of Baltimore County. There is scarcely three hundred feet of level road the entire length. The heaviest grade on a tangent is 319 feet, and on a curve 352 feet per mile. The sharpest curve has a radius of but 50 feet, and the largest 89 feet.

One of the Daft cars was used for the experiment, on the floor of which 49 one-quarter horse-power (four-plate) cells were placed.

This battery was connected to the motor by a three-way switch for connecting either 29, 39 or 49 cells, according to the power required.

These cells were part of a lot that had been made for lighting purposes, and not intended for the purpose for which they were used. The total weight of car, with battery, motor and 18 passengers, was about 10,000 lbs. At start 29 cells were used, indicating an E.M.F. of 42.63 volts and 61 amperes. The total resistance in circuit was .6943 ohms. The horse-power developed was 3.4.

In passing around curves and ascending the grades, 39 and 49 cells were necessary. In the latter case, the total resistance was .83 ohm; the E.M.F., 72.18 volts; and the current, 87 amperes, developing 8.5 horse-power.

The speed attained was eight miles per hour on the level, and from four to six on the curves and grades.

Several trips were made over the road, in order to discover, if possible, the weak points in the system. None were developed.

The plans for this experiment were devised by Mr. A. H. Bauer, the electrician of the Viaduct Manufacturing Company, who has within the past two years made the storage battery practicable.

The success of this demonstration proves conclusively that the use of storage battery for street car purposes is the only solution of the problem of substituting electricity for horses in cities.

It is now the intention to put the system into service on the principal railways in Baltimore.

For that purpose, large cars, capable of carrying sixty passengers, will be equipped with battery, motor, etc.

Sufficient battery power will be furnished to develop ten horse-power on the shaft.

All the plans for the system have been thoroughly worked out by Mr. Bauer, the details of which will be made public as soon as the patents are issued.

Judging from the interest shown by the different street railway companies in the work done by Messrs. Daft and Bauer, it is believed to be a question of but a short time when, for the purpose under consideration, horses will be displaced by electricity.

C. D.

* * A telegram from Madrid, dated Wednesday last announces that all the telegraph clerks are ill of cholera.

* * It has been observed in Russia that extreme cold converts tin into a semi-crystalline mass containing large cavities. In one instance the pipes of a church organ were so altered by cold as to be no longer sonorous.

* * The following resolution has been adopted by the Underground Wire Commissioners of Brooklyn: "Resolved—That this Board invites from all persons or corporations interested in the adoption of a general underground electrical system plans or suggestions in writing, and will grant special hearings in cases where, after examination of the papers thus submitted, it shall deem such hearings advisable. That all communications intended for the Board should be addressed to the Board of Commissioners of Electrical Subways, City Hall, Brooklyn."

Going Up the Indianapolis Electric Tower.

Last week a number of persons took the elevator and mounted to the basket at the top of electric light tower in Circle Park, Indianapolis. Among these were Harvey Bates, J. C. McCutcheon, Philip Igoe, and Arthur Edmunds. Mr. McCutcheon, in going up, took with him a thirty five-dollar field-glass, intending to indulge in a view of the city from the giddy height. In ascending, he forgot to take his foot off the brake, and when he got to the top his head struck with such force that he thought his nose and chin had telescoped, and the field-glass fell to the ground, where it was broken into pieces so fine that a 500-diameter microscope would not have been equal to the task of finding the pieces. Arthur Edmunds was the only one of the party who had sufficient hardihood to mount into the basket, and Joe Elliott, as a spectator, was much disturbed at the deficiency in nerve that was thus exhibited. "When I was a boy," said Mr. Elliott, "I was a great climber. There was not anything I was afraid to tackle. I have climbed shell-bark hickories more than ninety feet high."

This famous climber was easily induced to get into the elevator, but as he mounted upward he began to complain. He said his feet ached. It had been so long since he had had them such a distance from the ground that they grew dizzy, and so he came down again.

As he stepped on *terra firma* a ribald newsboy yelled out, "Say, mister, where is that old hickory nut nerve o' your'n, anyway?"

The men who have the tower in charge are very accommodating, and a large number of gentlemen have taken advantage of the opportunity to view the city.

The New York Commissioners.

Charles E. Loew, Jacob Hess and Theodore Moss, the Electrical Subway Commission, organized by making Mr. Loew president and Mr. Moss secretary. F. A. Lovecraft was appointed assistant secretary. This resolution, offered by Commissioner Loew, was adopted: "That it is the purpose of this Board to place and cause to be maintained underground all electrical conductors operated or to be operated in the city of New York, wherever practicable, and at the time and in the manner required by law. That all persons, companies and bodies using or operating electrical conductors, and coming within the purview of the law, be forthforth notified by the secretary that this Board has been organized and has assumed the duties imposed upon it, and is proceeding to discharge the same according to law, and this Board will forthwith meet at the Metropolitan Hotel and duly consider any plans, maps or methods, and request that plans, maps and methods be submitted as soon as practicable before the expiration of sixty days, in order that the general discharge of the functions of the Board may be expedited and the law carried into effect as soon as possible."

Another resolution, offered by Commissioner Moss, called upon occupants of houses to refuse permission to telegraph men to place wires over or on their buildings, unless such men have a permit from the Board, was adopted.

* * Sir James Douglas and several members of the Elder Brethren of the Trinity House, England, are conducting a further series of experiments at the experimental lighthouses at the South Foreland.

* * As showing the enterprise of the owners of the Burrumbeet in adopting all the latest improvements, the ship has been fitted up with the electric light throughout in addition to, and quite independent of, the ordinary lamps.

*** A meeting of stockholders of the Western Pennsylvania Telephone Company was was held in Pittsburgh after the decision against them. It was agreed to pay off all creditors before the end of the month. The stockholders were unanimous in consenting to carry the suit against the Bell Company to the highest Federal court, as they are satisfied they have a good case.

Three Good Electric Light "Points."

Editors Electrical Review:

A paragraph in your Western news of July 11 is suggestive of three interesting points now coming prominently before the public. The item reads:

"Estimates for an electric light plant were recently asked for in a town not a thousand miles from Detroit. Several responses were made by various companies, and these ranged between a little over $3,000 and about $14,000, the specifications in all cases being the same."

The three points are:

1. The desirability of "specifications," drawn by a competent electric light engineer, as a matter of protection to the purchasers of the plant. This will be found especially forcible in incandescent systems, now deservedly attracting attention from the fact that they are showing themselves genuine dividend-paying investment. Such specifications, in accordance with the most economical conditions, and with the conservative policy of the intelligent insurance inspector, will be found to save any new company untold difficulty and annoyance, while an enforced adherence to their provisions will facilitate a ready comparison of the cost of rival systems.

2. The actual difference in the expense of construction, and in many cases maintenance, of installations by different companies. This was illustrated only the other day, in a competitive bid for a small system within a hundred miles of Boston. Here careful inquiry developed the fact that one of the companies required by the conditions of their work, sixteen times as much copper in conductors as another, to do the same lighting with the same percentage of loss in distribution. This is only one of the items in which the watchfulness of a competent electric light engineer will serve a new organization.

3. The last point is the self-evident fact that in their efforts to get the business, too many companies are doing work, as your article, in its comments, tersely puts it, as if already "sufficiently wealthy, and anxious to put up lights for their health." The tendency of this kind of cut-throat competition is as ruinous as was that of the telephone rivalry in 1878–9, when the public were educated to believe that $1.50 a month was a fair price for an exchange connection, and $2 was an exorbitant charge—an impression which has required years to correct, and in fact doesn't seem to be corrected yet—in Indiana. The wisdom of the consolidation of arc light interests in Boston, with its consequent standardizing of rates, is not only apparent to the electric light stockholders, but to every citizen who is willing to pay a fair price for his light, and desires to see this growing and successful competitor of the gas monopoly occupy a position where permanence and good service will be assured.

W. J JENKS.

New York, July 18, 1885.

* * On Friday night a Philadelphia man gave his wife, as he supposed, a glass of nerve tonic. Upon her saying that it was not her medicine and tasted like poison, the man, to prove that he was right, drank a half glass from the same bottle. It was subsequently found that both had swallowed "battery fluid," a preparation for charging a small electric battery and made up of sulphuric acid, sulphate of copper and chlorate of potash. The wife died Saturday night, and the husband is still in a dangerous condition.

* * Tropical Telephone is selling at 1¼. The second dividend of the company is now payable on demand at the office of the company, 95 Milk street, Boston. It is probable that a division of assets of the Continental Telephone Company, of two shares of the International Bell Telephone Company and 25 shares of Tropical Telephone Company to every 5 shares of Continental, will soon be made. There are 3,500 shares of Continental. There will then remain other assets which are expected to bring a sum equal to $10 per share in cash.

The Viaduct Manufacturing Company.

The factory of the Viaduct Manufacturing Company, of Baltimore, is located a few miles out of the city on the Baltimore & Ohio Railway, in one of the most pleasant locations imaginable. Instead of the close quarters and bad atmosphere of the city, the workmen have everything to make their labors agreeable. The cut of the factory, Fig. 1, does not give all the buildings comprising the company's works, as a new one has lately been erected. The name of the company is taken from the viaduct of the railroad company, seen in the illustration. Power in abundance is furnished by water through four turbine water-wheels, reducing the power expense to the minimum. The carpenter shop, where all the woodwork for the apparatus is turned out, is a large, airy room, 125 by 52 feet; the machine shop, 130 by 40 feet. The Viaduct Company are just now devoting considerable attention to the question of storage batteries, illustrated in Fig. 2, and are manufacturing at the present time, President Davis states, some 400 batteries for use of the telegraph companies in the city. In the Baltimore Academy of Music, 255 Weston 16-candle lamps have been satisfactorily lighted by means of these storage batteries since May 1, 1884. Instead of lowering the degree of power by putting in resistance, it is done from a point on the stage by cutting off cells. The manager of the Academy is well pleased with the lighting.

The first successful trial ever made in the United States of the storage battery as a street-car motor, was made by the Viaduct Company last week. This company, which is the only one in this country manufacturing storage batteries on a large scale, is greatly pleased with the result of the test, which is reported in the Baltimore *Sun* as follows:

"A successful test and demonstration of the electric storage battery as a motive power for city passenger railways was made yesterday morning on the Union Passenger Railway from the stables on Huntingdon avenue to Hampden, Baltimore county, and return. Among those who went out on the trial trip were Messrs. A. G. Davis, A. B. Davis and A. B. Proal, representing the Viaduct Manufacting Company at the Relay Station, Baltimore and Ohio Railroad, a large portion of which was built for the manufacture of electric storage batteries, and the batteries used yesterday were made by them. Mr. James R. Clarke, president of the company; Mr. A. H. Bauer, the electrician of the company, under whose direction the practical test was accomplished; Mr. W. W. Donaldson, assistant electrician; Mr. H. A. Foster, the electrician for the Daft Electric Company, of New York, whose motor was used in connection with the storage battery; Mr. T. C. Robbins, superintendent of the railway company, who allowed the use of his motor, tracks and cars for the experiment. Eighteen persons were in the car, which, with the weight of the car, motor, etc., made a total of 5½ tons. The car moved out of the yard, passing over grades of 235 feet to the mile and around curves with 75 feet radius with ease and comfort. The batteries used on the occasion were simply the ¼-horse power, not even made for motive power, but for incandescent light. But Mr. Bauer, the electrician, after figuring out the subject, decided that even with these small boxes a street-car could be run, as was fully demonstrated. Forty-nine of the little ¼ horse-power boxes were placed in the cab and connected with the Daft electric motor. On level grades only 29 of these boxes were used, the loaded car making easily six miles an hour. On the 235-feet grade the 49 boxes were used, equal to $8\frac{6}{10}$ horse-power.

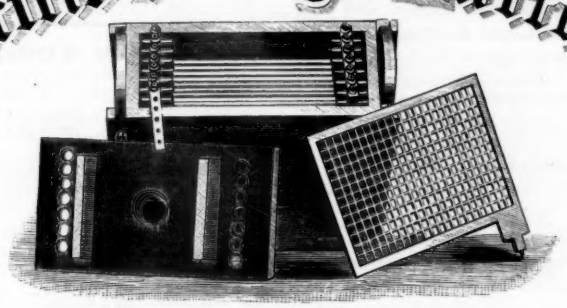
"A storage battery especially constructed for street-car purposes would consist of one-horse-power boxes instead of one-quarter, and about 65 would be required. The storage company yesterday simply placed their small boxes in the motor car used by the Daft Company. In practical usage these boxes will be put under the seats of the ordinary passenger car. The car will be started or stopped by simply turning a switch. An ordinary hand-brake was used yesterday, though this in future will be done by electricity.

"The first advent of the storage battery in this country was on the steamship Labrador, in November, 1882, at which time the rights under the patents for Maryland, District of Columbia and West Virginia were purchased by Mr. A. G. Davis, who from then until now has had faith that he would, in due time, take the ride given yesterday, and to that end, laboring with a few friends, has spent thousands of dollars. His factory, the Viaduct, is the only concern in this country which has made experiments and finally demonstrated the practical use of the storage battery. This battery is not in competition with the electric motor, for a dynamo has to be used first to produce the electricity and store it, and then to receive and discharge it. The storage battery would supersede the need of the third rail on passenger railway tracks when electricity is applied. The car will carry the power with it. The storage battery at the same time that it is used for power can be utilized for light. Any number of incandescent lamps can be attached to the battery, and thus a car will have with it at all times its power to light. The storage company people say that yesterday's experiment demonstrated the usefulness of storage batteries as motive power for street cars. They propose at once to arrange the storage batteries for a street car such as is used by President Bowie's City Passenger Railway Company. When they are complete the car will be put on the tracks and run through the city from one end to the other."

The Viaduct Company, in addition to their electrical works—in which they are well equipped to manufacture all appliances—are engaged in manufacturing the "cash car," a valuable invention for the conveyance of packages, merchandise, and cash, doing away with the vexatious cash boys. The company controlling this invention is the Continental Stove Service Company, G. R. Blanchard, president, and A. B. Proal, treasurer. The cash car is in use by Ehrich Bros., of New York, who are greatly pleased with it.

THE FAURÉ

Electric Storage Battery



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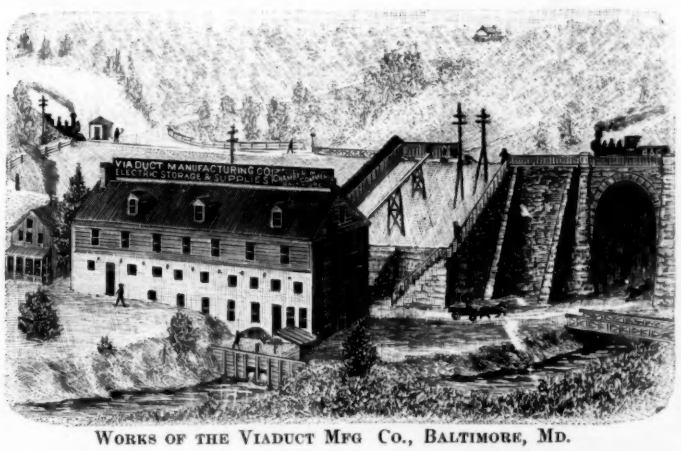

WORKS OF THE VIADUCT MFG CO., BALTIMORE, MD.

—— The City Council of Lawrence, Mass., accepted the proposition of the Edison Electric Illuminating Company to light the streets of the city for $650 per month. This is $1,300 per year cheaper than done by the gas company.

—— A horse was thrown down in New York a few days ago by the iron shoe of one foot coming in contact with the cover of a manhole for the electric light wires, which was affected by leakage, while the other foot touched the iron rail of the Bleecker street horse railroad.

—— Both the Brush and Jenney electric light companies are erecting towers in Indianapolis, and between the two the city will probably get some excellent lighting at a very small expense. Both companies will make arrangements to supply the light every night for several months, in order that the people can have a fair test of its worth.

—— At 51 State Street, Boston, there is in operation an exceedingly interesting electrical experiment, which, if it terminates as successfully as it has thus far continued, will aid in solving the question of lighting houses, railway carriages, sleeping cars, etc., with a primary battery current. The inventors and patentees of the battery, Messrs. Kauffer & Goldner, have placed their original plant at the disposal of certain parties, who are making tests to demonstrate the power and permanence of this system. The battery was set up with weighed materials, and inclosed in a box which was fastened with wax seals by the parties who are making the experiment. By a clockwork that operates an armature by an independent cell, which is also inclosed in a sealed box, the current from the battery is broken and closed at intervals of six minutes. The current thus broken is connected with two incandescent lamps, which are, of course, lighted for six minutes and extinguished for the same length of time. It will be seen from this that the lamps burn thirty minutes out of every hour. All the connections in the circuit are fastened by wax seals. At noon on Tuesday, July 7, the battery was started. At noon yesterday it had run four days, the circuit having been closed half that time, or forty-eight hours. It is safe to say that heretofore a circuit of nine cells has never been devised that would run two incandescent lamps half that time. The original claim of the inventors, which led to the experiment now in operation, was that their battery of nine cells would light two eight-candle-power incandescent lamps for 150 hours out of 300. The lamps have been already burning more than a third of that time, and as yet show no signs of being exhausted. The final result of the experiment is being watched with much interest by electrical people.

ELECTRIC LIGHT NEWS

—— Holyoke claims the honor of being the first town in Massachusetts to introduce electric light.

—— The New Bedford Electric Light Company has declared a quarterly dividend of 2 per cent.

—— There are 150 electric lights in use in Springfield, Mass., and the company has orders for more.

—— The United States Electric Company's station, Washington, D. C., was destroyed by fire Thursday night.

—— Lockport, N. Y., is to be lighted by electricity hereafter, the City Council having authorized the mayor to contract for the same.

—— Additional street lights, all electric, have been ordered by the city of Hartford, Conn. There are now 101 lights in use by the city, and 25 more are to be added during the next few months.

—— The German-American Optical Company, of Frankfort, Germany, are erecting extensive works, and will use American skilled labor and the most improved American machinery in their works. Their business requiring the most perfect regulation in their machinery, they have purchased a Ball automatic cut-off engine for their power.

—— In the heart of Wyoming Territory is a mountain of solid hematite iron, with 600 feet of it above-ground, more than a mile wide and over two miles in length; a bed of lignite coal big enough to warm the world for centuries; eight lakes of solid soda, one of them over 6,000 acres in extent and not less than 30 feet in depth; a petroleum basin which contains more oil than Pennsylvania and West Virginia combined, from which in places the oil is oozing in natural wells at the rate of two barrels a day.

—— Mr. Edward H. Goff, president of the American Electric Manufacturing Company, has issued a new pamphlet showing the financial and commercial success of electric lighting from central lighting stations under the "American system." The companies mentioned in the pamphlet were all organized and equipped by the American system, and each is indorsed by the local officers as giving satisfaction to patron and stockholder. There are twenty-five or thirty companies in all, and the reports from their officers indicate a prosperous condition throughout. The facts presented by Mr. Goff in this record cannot fail to interest all who are in any manner connected with electric lighting, and a copy of the pamphlet will be sent to all who address the American Company, Twenty-third street and Fifth avenue, New York.

—— Among the recent electrical developments in Woburn, Mass., is the central lighting station, recently established, and the new factory of the Sun Electric Lighting Company, which occupies the Main Street Rink, it having been recently put in condition for this business. Mr. Slattery, the electrician of the Sun Company, has in his own dwelling, on Glenwood street, a small domestic lighting plant, lately installed. The plant consists of a small water motor, operated by the ordinary water supply, a tiny dynamo-electric machine, and the necessary wires, switches, sockets, electroliers and lamps. The light given by the little lamps is peculiarly pure and brilliant, and the heat produced is only a fifteenth of that evolved by an equal quantity of light from gas. This little plant appeared to work admirably with a set number of lamps, which, however, may be turned on and off in the usual way, but Mr. Slattery is engaged in perfecting arrangements by which everything will be automatically governed, and by which the entire plant may be regulated, if necessary, or turned on or shut off, from the sitting-room or any other place, without the necessity of descending to the basement or other location of the motor or dynamo. Mr. Slattery's residence has been visited lately by hundreds of people. The water-power motor used has been patented by C. B. Coombs, and are being manufactured by Furlong & Cummings, of Woburn.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 14, 1885.

321,960 Telephone. James H. Freeto, Mechanicsburg, Ill.

321,990 Device for preventing sparking in dynamo-electric machines; Richard H. Mather, Windsor, Conn.

321,991 Support for the armatures of dynamo-electric machines; Richard H. Mather, Windsor, Conn.

321,992 Duplex telegraph; Lawrence A. McCarthy, Brooklyn, N. Y.

322,018 Conduit for underground wires; Warren D. B. Smith and Frank J. Milliken, Boston, Mass.

322,023 Automatic circuit closer for telegraph keys; Homer P. Thompson, Cincinnati, Ohio.

322,024 Incandescent electric lamp; Jean Van Gestel and Charles F. Beck, Paris, France, said Beck assignor to said Van Gestel, and said Van Gestel assignor of one-third to Thomas S. Harrison, Philadelphia, Pa.

322,033 Electric Light; Charles F. Beck, Paris, France, assignor to Thomas S Harrison, Philadelphia, Pa.

322,110 Electric alarm clock; Charles Korfhage, Brooklyn, N. Y.

322,115 Electric arc light; Charles Lever, Bowdon, County of Chester, England.

322,122 Telephone switch; Thomas J. Perrin, New York, N.Y., assignor to the National Improved Telephone Company, New Orleans, La.

322,138 System of electric distribution; Elihu Thomson, Lynn, Mass.

322,139 System of Electric distribution; Elihu Thomson, Lynn, Mass.

322,169 Apparatus for refining copper by electricity; Moses G. Farmer, New York, N. Y.

322,170 Apparatus for refining copper by electricity; Moses G. Farmer, New York, N. Y.

322,214 Electric apparatus protector; Theodore N Vail, Boston, Mass.

322,230 Dynamo-electric machine: Edwin R. Whitney, Manchester, N. H., assignor to Samuel Caldwell Forsaith and William Ellerly Drew, both of same place.

322,233 Electric gas lighting apparatus; Horatio N. Williams, Providence, R. I.

322,310 Dynamo electric machine; Peter L Miles, Cleveland, Ohio, (administrator of Chas. F. Ruset, deceased), assignor to Martin Keeper, Henry J. Myers, William F. Buchholz, Jacob Rahn, Simon R. Thorman, and the estate of Chas. F. Ruset, deceased, all of same place.

322,317 Electric time lock; William E. Pierce, Newark, N. J.

322,333 Means for preventing interference in combined telegraphic and telephonic systems; Francois Van Rysselberghe, Shaarbeck, Belgium.

322,335 Electrical printing press feeder; Jean A Wetmore, Brooklyn, N. Y.

322,375 Electric incandescent sign; Isaac W. Heysinger, Philadelphia, Pa.

322,385 Electrical conducting system; John Ruesi, Brooklyn, N. Y.

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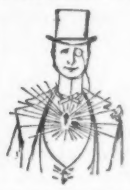

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